

# Studies on Science, Magic, and Life in the Middle Ages

## by Lynn Thorndike

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[Lynn Thorndike](#) (1882-1965), an American historian of medieval science and magic, published the studies below in a variety of journals between the years 1908 and 1965.

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[The Attitude of Origen and Augustine toward Magic](#), from *The Monist*, Vol. 18, No. 1 (January, 1908), pp. 46-66.

[A Roman Astrologer as a Historical Source: Julius Firmicus Maternus](#), from *Classical Philology*, Vol. 8, No. 4 (Oct., 1913), pp. 415-435.

[Roger Bacon and Experimental Method in the Middle Ages](#), from *Philosophical Review*, Vol. 23, No. 3 (May, 1914), pp. 271-298.

[Some Medieval Conceptions of Magic](#), from *The Monist*, Vol. 25, No. 1 (January, 1915), pp. 107-139.

[Galen: The Man and His Times](#), from *Scientific Monthly*, Vol. 14, No. 1 (Jan., 1922), pp. 83-93.

[The Latin Pseudo-Aristotle and Medieval Occult Science](#), from *Journal of English and Germanic Philology*, Vol. 21, No. 2 (Apr., 1922), pp. 229-258.

[The Historical Background of Modern Science](#), from *Scientific Monthly*, Vol. 16, No. 5 (May, 1923), pp. 488-497.

[L'Encyclopedie and the History of Science](#), from *Isis*, Vol. 6, No. 3 (1924), pp. 361-386.

[The Blight of Pestilence on Early Modern Civilization](#), from *American Historical Review*, Vol. 32, No. 3 (Apr., 1927), pp. 455-474.

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[Vatican Latin Manuscripts in the History of Science and Medicine](#), from *Isis*, Vol. 13, No. 1 (Sep., 1929), pp. 53-102.

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[A pest tractate before the black death](#), from *Sudhoffs Archiv für Geschichte der Medizin*, Bd. 23, H. 4 (1. Oktober 1930), pp. 346-356.

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[Mediaeval Interest in Intellectual History](#), from *Speculum*, Vol. 25, No. 1 (Jan., 1950), pp. 94-99.

[Mediaeval Magic and Science in the Seventeenth Century](#), from *Speculum*, Vol. 28, No. 4 (Oct., 1953), pp. 692-704.

[The True Place of Astrology in the History of Science](#), from *Isis*, Vol. 46, No. 3 (Sep., 1955), pp. 273-278.

[Eclipses in the Fourteenth and Fifteenth Centuries](#), from *Isis*, Vol. 48, No. 1 (Mar., 1957), pp. 51-57.

[Chiromancy in Mediaeval Latin Manuscripts](#), from *Speculum*, Vol. 40, No. 4 (Oct., 1965), pp. 674-706.

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THE ATTITUDE OF ORIGEN AND AUGUSTINE TOWARD MAGIC

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## THE ATTITUDE OF ORIGEN AND AUGUSTINE TOWARD MAGIC.

GROSS superstition among the masses and (to speak mildly) an unscientific attitude among the most highly educated were prominent features of the intellectual life of the great Roman world under the emperors. Indeed it is to be feared that these features had by no means been entirely absent from the palmiest days of Greek genius. Divination, vouched for by religion and politics, captivated science and philosophy as well. The learned Ptolemy wrote on the art of astrology, while Stoics and Neo-Platonists propounded ingenious theories in support of the various forms of foretelling the future and of the occult interaction of objects. Medicine was full of the use of charms, numbers and irrelevant ceremonial, and the other natural science which then was in existence was in like manner inclined to the fantastic. There was a widespread belief in the existence of countless demons with powers over the different parts of the material universe, demons whose services men might obtain by the use of proper words and formulæ. Finally there lurked in men's minds a conception of a mysterious form of practice or body of lore called "magic." To reduce this conception to definite terms is difficult. A few held magic to be of practical benefit and soul-inspiring; the vast majority would have it the source of crimes and the bane of mankind, but that was about as far as they went in the way of definition.

Pliny the Elder, whose *Historia Naturalis* affords the most comprehensive view of ancient science in the Roman world and who is our chief authority in that age concerning magic, regarded it as always reprehensible, yet declared that of all arts its influence had been greatest in every land and in almost every age; that it had embraced and combined into one the three other things which appealed most powerfully to the human mind,—religion, medicine and astrology,—a statement the truth of which his own unconscious confusion of superstition and science often corroborates. Thus to a certain extent he identified magic with the fantastic conceptions which infected the religion and science of his day, and made the term emblematic of an unscientific attitude, a precedent which we may have occasion to follow.

Into this Roman world entered a new force, a religion which was to overcome all other creeds in Europe. Divination formed no part of its doctrine or ceremonial; astrology it looked at askance as infringing on human free will, special providences and divine omnipotence. Consequently with the prevalence of this new religion was likely to come a change in the attitude of the Western world to such superstitions. This change may be seen to some extent in the pages of two prominent Christian writers, Origen (185-254 A. D.) and Augustine (354-430), especially in their well-known works, *The Reply to Celsus* and *The City of God*. Origen, writing in Greek at Alexandria, familiar with all the culture of his times and also with its past, by his urbane, broad-minded and erudite exposition of the Christian religion and its relation to life, did perhaps more than any other man to bring over educated and thinking pagans of that day to the new faith. The fact that some of his doctrines were later pronounced heretical lessened greatly in all probability his influence upon mediæval Christians, but Augustine's influence and power rather grew with time.

Thus the present survey will throw some light on the mediæval attitude toward magic and occult science.

Both Origen and Augustine, by the frequency with which they refer to the subject and by the way in which they speak of it, reveal the prominence of what they called "magic" in the life and thought of their times. The term seems to cover practices which are of every day occurrence and to represent concepts which are present before every mind. True, a chief reason for the discussion of magic by these Christian apologists is their wish to refute the imputation to Christianity by its opponents of the use of sorcery and incantations and to discriminate between miracle and magic, holy prophecy and divination. But this is not the sole reason for their references and moreover the very existence of such imputations and denials goes far toward demonstrating the prominence of magic in their day.

Both writers define magic in practically identical terms. Their definition is more precise than the vague references to which most pagan writers limit themselves and narrower than Pliny's description of magic which in a way associates the term with superstition and unscientific attitude in general. Their definition is especially noteworthy because it is the one which prevailed throughout the Middle Ages. Magic is, according to them, the outcome of man's illicit relations with demons whom he coaxes or coerces by spells and incantations. Origen speaks of "magic and sorcery whose wonders are worked by wicked spirits, held spell-bound by elaborate incantations and yielding themselves to sorcerers."<sup>1</sup> Augustine explains that demons are enticed to work marvels not like animals by food but as spirits by symbols which conform to their individual tastes, various kinds of stones, plants, living creatures or cere-

<sup>1</sup> Reply to Celsus, II, 51. . . . *μαγείαν καὶ γοητείαν, ἐνεργουμένην ὑπὸ πονηρῶν δαιμόνων, κατακλήσεσι περιέργοις θελγομένων, καὶ ἀνθρώποις γόησιν ὑπακούοντων.*

monial utterances. "Whence arose the magic arts and their practitioners."<sup>2</sup>

Both writers accept the principle of sympathetic magic and of the power of symbols. Augustine, it is true, explains that the demons first instructed men as to what objects or signs would attract and repel them, but he does not deny that, these secrets once disclosed, the charms of the magician have efficacy. Origen, moreover, in one place expresses doubt whether demons can cure the body, whose different members Celsus, on the authority of the Egyptians, had declared subject to thirty-six demons, but elsewhere he speaks of the demons as having different regions of the earth assigned to them.<sup>3</sup>

But although Origen and Augustine believe in the existence of sorcery, they utterly disapprove of it and assert that Christians have nothing to do with it,—which

<sup>2</sup> City of God, XXI, 6. Addimus enim ad istam lucernam inextinguibilem et humanarum et magicarum, id est per homines dæmonicarum artium et ipsorum per se ipsos dæmonum, multa miracula; quæ si negare voluerimus, eidem ipsi cui credimus sacrarum litterarum adversabimur veritati. . . Inlicuntur autem dæmones ad inhabitandum per creaturas quas non ipsi sed Deus condidit, delectabilius pro sua diversitate diversis, non ut animalia cibis, sed ut spiritus signis, quæ cuiusque delectationi congruunt, per varia genera lapidum herbarum lignorum animalium carminum rituum. Ut autem inliciantur ab hominibus, prius eos ipsi astutissima calliditate seducunt, vel inspirando eorum cordibus virus occultum vel etiam fallacibus amicitiiis apparendo, eorumque paucos discipulos suos faciunt plurimorumque doctores. Neque enim potuit, nisi primum ipsis docentibus, disci quid quisque illorum adpetat, quid exhorreat, quo invitetur nomine, quo cogatur; unde magicæ artes earumque artifices exstiterunt.

<sup>3</sup> Reply to Celsus, V, 10. Possibly Origen believed that since the coming of Christ the demons had lost the power which they once possessed. In his discussion of the appearance of the star of Bethlehem to the three magi he explains that the magi, having dealings with demons, are able to bring wonders to pass until "some more divine and powerful thing than the demons or the incantations used to invoke them appears or is spoken." Then the efforts of the demons become unavailing since the spirits "are not able to face the light of the godhead."—Reply to Celsus, I, 60. . . . μάγοι, δαίμοσιν ὁμιλοῦντες, καὶ τοῦτους ἐφ' ᾧ μεμαθήκασι καὶ βούλονται καλοῦντες, ποιῶσι μὲν τὸ τοιοῦτον, ὅσον οὐδὲν θεϊότερον καὶ ἰσχυρότερον τῶν δαιμόνων, καὶ τῆς καλοῦσης αὐτοὺς ἐπὶ ὧδ' ἐπιφαίνεται ἡ λέγεται ἂν δὲ θειοτέρα τις ἐπιφάνεια γένηται, καθαιροῦνται οἱ τῶν δαιμόνων ἐνέργειαι μὴ δυνάμενα. ἀντιβλέψαι τῷ τῆς θεότητος φωτί.

is more, Origen adds, than can be said of pagan philosophers.<sup>4</sup> For our two writers regard the "demons" of the ancients as evil spirits, as devils. They feel that the functions and powers attributed to these spirits are inconsistent with the monotheistic faith which Christians profess, but as they do not possess the mental boldness to deny the demons' existence altogether, they represent them as enemies of Almighty God but as tolerated by him. Similarly magic is an evil which exists through man's depraved curiosity, the evil nature of the demons and God's unfathomable forbearance.

Augustine speaks several times of "the crimes of magicians."<sup>5</sup> Defending Christian miracles, he asserts that

"They were wrought by simple confidence and devout faith, not by incantations and formulæ composed through an art characterized by depraved curiosity, which people call either magic or by the more abominable name, sorcery (*goetia*), or the honorable title of theurgy, endeavoring as it were to distinguish different varieties and wishing to make it out that some men are devoted to illicit and condemned practices—who are properly termed wizards, for these they say practice sorcery—while others, to whom they assign theurgy, are to be considered praiseworthy. But both classes are alike entangled in the deceptive ceremonies of demons who masquerade under the names of angels."<sup>6</sup>

Augustine is for a moment somewhat shaken in this stand against theurgy by the authority of Porphyry who had stated that theurgy was useful to purge the soul and prepare it to receive spirits and to see God. However,

<sup>4</sup> City of God, X, 9. Reply to Celsus, I, 6, 38; VI, 39, 41; VII, 4.

<sup>5</sup> City of God, VIII, 18, 19, 26; IX, 1.

<sup>6</sup> *Idem*, X, 9. "Hæc et alia multa huiusce modi, quæ omnia commemorare nimis longum est, fiebant ad commendandum unius Dei veri cultum et multorum falsorumque prohibendum. Fiebant autem simplice fide adque fiducia pietatis, non incantationibus et carminibus nefariæ curiositatis arte compositis, quam vel magian vel detestabiliori nomine goetian vel honorabili theurgian vocant, qui quasi conantur ista discernere et illicitis artibus deditos alios damnabiles, quos et maleficos vulgus appellat (hos enim ad goetian pertinere dicunt), alios autem laudabiles videri volunt, quibus theurgian deputant; cum sint utrique ritibus fallacibus dæmonum obstricti sub nominibus angelorum."

by representing Porphyry as condemning the art in other passages and as after all meaning that it is useful to the worldly part of the human spirit, not to the intellectual and spiritual, Augustine succeeds in evading the difficulty.<sup>7</sup> Moreover, he was inclined to believe that astrological predictions which came true were due to the inspiration of demons, and so would include that art as well as theurgy under his definition of magic.

Origen, on the contrary, in other passages than those in which he denies any connection between Christianity and its followers and magic, does not always maintain the same standard of censure. He seems to know a little more about the subject than he ought.<sup>8</sup> We find him twitting Celsus with not being able to distinguish magi from Chaldeans<sup>9</sup> and again setting his adversary to rights in regard to the definition of sorcery.<sup>10</sup> He also coolly employs the testimony of those skilled in incantations to prove his point<sup>11</sup> and in discussing the power of names, a matter re-

<sup>7</sup> City of God, X, 9, 10.

<sup>8</sup> Origen regarded magic as an art requiring no little learning and skill. Note the passage already cited (Bk. VII, Chap. 4) in which he affirms that Christians expel demons from the sick "with no curious art and employment of magic and of potions but by prayer alone and the simplest adjurations such as the plainest man may use." Evidently the plainest man could not hope to excel at magic. Similarly Augustine distinguishes miracle from magic partly by the fact that "simple confidence" sufficed for the one, while "art" was required for the other. (See note 6.)

<sup>9</sup> Reply to Celsus, I, 58.

<sup>10</sup> *Idem*, IV, 86. "Celsus says, 'If men have any understanding of sorcery, far more informed in this respect are snakes and eagles. For these are thoroughly acquainted with means of warding off poisons and averting evil, and with the virtues of certain stones for the preservation of their young. Whereas if men happen upon these remedies, they think they have gained a wondrous prize.'

"Now first of all I don't understand how he has termed sorcery either the experience or a certain physical intuition of living creatures concerning natural means of warding off poisons. For the usage has been to apply the term sorcery to another thing."

We must agree with Celsus, however, that the virtues attributed to stones were often magical, if not connected with sorcery.

<sup>11</sup> *Idem*, I, 25.

garded by him as profound and sacred, he makes the following remarkable statement:

"If then we succeeded in the preceding passage in showing the nature of powerful names, some of which are used by the erudite of Egypt, or by those of the magi among the Persians who are skilled in words, or the Brahmins among Indian philosophers, or the Samaneans, and so on in each of the nations; and if we were able to demonstrate that the so-called *magic* also is not, as followers of Epicurus and Aristotle think, an entirely chaotic affair but, as those skilled in such matters show, a connected system comprising words known to very few persons; then we affirm that the names Sabaoth and Adonai and others handed down among the Hebrews with great solemnity lie not within the scope of accidental and created things but pertain to a certain mystic theology, concerned with the Creator of all things."<sup>12</sup>

Thus despite his affirmation of the absolute incompatibility of magic and the Christian religion, Origen seems to have recognized a connection between magic and theology,<sup>13</sup> and to have dared on occasion to speak of magic not merely without condemnation but almost with approval.

<sup>12</sup> Reply to Celsus, I, 24. 'Ἐὰν τοίνυν δυνηθῶμεν ἐν προηγουμένῳ λόγῳ παραστήσαι φύσιν ὀνομάτων ἐνεργῶν, ὧν τισι χρῶνται Αἰγυπτίων οἱ σοφοὶ ἢ τῶν παρὰ Πέρσαις μάγων λόγιοι, ἢ τῶν παρ' Ἰνδοῖς φιλοσοφούντων Βραχμᾶνες, ἢ Σαμαναῖοι, καὶ οὕτω καθ' ἕκαστον τῶν ἔθνων· καὶ κατασκευάσαι οἰοί τε γενόμεθα, ὅτι καὶ ἡ καλουμένη μαγεία οὐχ ὥς οἰοῦνται οἱ ἀπὸ Ἐπικούρου καὶ Ἀριστοτέλους πρᾶγμα ἐστὶν ἀσίστατον πάντη, ἀλλ' ὥς οἱ περὶ ταῦτα δεινοὶ ἀποδεικνύουσι, συνεστὼς μὲν, λόγους δ' ἔχον σφόδρα ὀλίγοις γνωσκομένους· τότ' ἐροῦμεν, ὅτι τὸ μὲν Σαβαὼθ ὄνομα, καὶ τὸ Ἀδωναί, καὶ ἄλλα παρ' Ἑβραίοις μετὰ πολλῆς σεμνολογίας παραδιδόμενα, οὐκ ἐπὶ τῶν τυχόντων καὶ γεννητῶν κεῖται πραγμάτων, ἀλλ' ἐπὶ τινος θεολογίας ἀπορήτου, ἀναφερομένης εἰς τὸν τῶν ὅλων δημιουργόν. Διὸ καὶ δύναται ταῦτα τὰ ὀνόματα, λεγόμενα μετὰ τινος τοῦ συμφυοῦς αὐτοῖς εἰρμοῦ.

It may be argued that Origen here distinguishes "so-called magic" from real "magic" which he in other passages condemns as no pursuit for Christians; that he believes that this so-called magic is not truly magic at all. This, however, is a dangerous assumption, for the "so-called magic" is apparently what the Epicureans and the followers of Aristotle mean when they say magic, while Origen himself informs us elsewhere (I,22) that those who conjure demons—i. e., magicians—use such phrases as "God of Abraham" in so doing.

<sup>13</sup> Indeed even when distinguishing between miracle and magic, holy prophecy and divination, he displays a certain nonchalance which is rather surprising. The Jews, he argued, must have had prophets, since, being forbidden



Origen's position was not unsimilar in other matters which hardly come under his own definition of magic but which we may safely regard as offspring of the same mental attitude that begets belief in magic. He was capable of such a notion as that the rite of circumcision was a safeguard against some angel hostile to the Jewish race.<sup>14</sup> Similarly he attributed a rather magical nature to prayer in affirming that Christians "using the prescribed prayers regularly day and night" need have no fear of sorcerers.<sup>15</sup> Indeed he believed that certain words possessed a mystic significance and power, and could not have been of human origin. In one passage he goes so far as to assert that the marvelous results obtained by the use of verbal formulæ are due to the words themselves, not to the things which they signify, since words potent in one language lose their efficacy with translation—certainly a strange statement to come from a Christian who had elsewhere expatiated on the miraculous power of "the simple name of Jesus."<sup>16</sup> Was that name alone, and not deity the cause of miracle?

by the Mosaic law "observers of times and diviners," they had no other means left of satisfying the universal human craving to ascertain the future. It was to quench this popular thirst that the Hebrew seers often predicted things of no religious or other lasting importance. In replying to Celsus's comparison of Christ's miracles to the feats of magicians, Origen admitted that they would be much alike but for the nobler ends which inspired the miracles of Jesus. See I, 36 and I, 68.

<sup>14</sup> Reply to Celsus, V, 48.

<sup>15</sup> *Idem*, VI, 41.

<sup>16</sup> *Idem*, I, 25. Τῆς δ' ὁμοίας ἔχεται περὶ ὀνομάτων φιλοσοφίας καὶ ὁ ἡμέτερος Ἰησοῦς, οὐ τὸ ὄνομα μυρίους ἤδη ἐναργῶς ἐώραται δαίμονας ἐξελάσαν ψυχῶν καὶ σωμάτων, ἐνεργήσαν εἰς ἐκείνους ἀφ' ὧν ἀπηλλάθσαν. Ἔτι δ' εἰς τὸν περὶ ὀνομάτων τόπον λεκτέον, ὅτι οἱ περὶ τῇ χρήσιν τῶν ἐπωδῶν δεινοὶ ἱστοροῦσιν, ὅτι, τὴν αὐτὴν ἐπωδὴν εἰπόντα μὲν τῇ οὐκείᾳ διαλέκτῳ ἔστιν ἐνεργῆσαι ὑπερ' ἐπαγγέλλεται ἢ ἐπωδὴ· μεταβαλόντα δὲ εἰς ἄλλην οἰανόητοισιν φωνὴν ἔστιν ἰδεῖν ἄγονον καὶ οὐδὲν δυναμένην. Οὕτως οὐ τὰ σημαινόμενα κατὰ τῶν πραγμάτων, ἀλλ' αἱ τῶν φωνῶν ποιότητες καὶ ιδιότητες, ἔχουσί τι δυνατόν ἐν αὐταῖς πρὸς τὰδε τινὰ ἢ τὰδε.

"With this same philosophy of names is connected our Jesus, whose name has been manifestly seen to have driven out demons from souls and bodies and to have taken possession of those from whom the demons were driven. Moreover while on this subject of names, it should be said that those skilled

Origen, however, disapproved of the favorite pagan methods of divination. He regarded the ordinary casting of horoscopes (*genethliologia*) as a deceitful art and spoke of it in the same breath with magic, Egyptian animal worship, and the Persian practice of cohabitation with relatives.<sup>17</sup> He had nothing but ridicule for the theory—at least when it was carried to its logical extreme—that history repeats itself with the recurrence of the constellations to their old positions. That Socrates would live again, say the same words and even wear the same clothes in the same old city of Athens seemed to him absurd. Yet he tells us that this theory was held by the Stoics and by the disciples of both Pythagoras and Plato.<sup>18</sup> Though Origen admitted the weight of the testimony of antiquity to the validity of augury, he pointed out that Moses had forbidden it and had classified as unclean the animals commonly used in that art. Origen accordingly concluded that whatever validity augury might possess was due to the agency of demons who predicted by means of birds or other animals, and that the true God would employ no such ignoble channels but the purest of prophetic souls to convey to men a knowledge of the future.<sup>19</sup>

in incantations assert that the same incantation, which when uttered in the proper language works the desired effect, if translated into any other language appears to fall flat and to have no result. Hence not the things signified according to the circumstances but the qualities and peculiarities of the language are the source of whatever power for this or that the incantation possesses."

See also Book VI, Chapter 45.

<sup>17</sup> Reply to Celsus, VI, 80. 'Ἐξῆς δὲ τούτοις ἐνθεώματα ἐξ ἀρχῆς ἔδοξε Κέλσῳ λέγειν ἔθνη Χαλδαίους, ἀφ' ὧν ἡ ἀπατηλὸς γενεθλιαλογία νενέμῃται τοὺς ἀνθρώπους. Ἀλλὰ καὶ μάγους τοῖς ἐνθεωτάτοις κατατάττει ἔθνεσιν ὁ Κέλσος, ἀφ' ὧν ἡ παρώνομος τοῦ ἔθνους αὐτῶν μαγεία καὶ τοῖς λοιποῖς ἔθνεσιν ἐπὶ διαφορᾷ καὶ ὀλέθρῳ τῶν χρωμένων αὐτῇ ἐπιδεδῆμηκε.

"In addition to these it seemed good to Celsus to call Chaldæans a nation most inspired from the beginning, by whom illusionary genethliology was spread among men. Moreover Celsus places among the most inspired nations the Magi, by whom magic (named after them) was bestowed on other nations to the ruin and destruction of those practising it."

<sup>18</sup> *Idem*, V, 20-21.

<sup>19</sup> *Idem*, II, 88-93.

Yet Origen himself accepted other channels of foreknowledge than holy prophecy. He believed that one might procure valuable information from dreams. Celsus, Origen's dialectical foe, in criticising the story of the flight into Egypt, stated that according to the scriptural narrative an angel had descended from heaven to warn Jesus' parents of the danger threatening the young child. Origen pointed out that the angelic warning came rather in a dream, an occurrence which did not seem marvelous to him at all, he said, since "in many other cases it has happened that a dream has shown persons the proper course of action."<sup>20</sup> Comets, Origen stated, appeared on the eve of dynastic changes, great wars and other terrestrial disturbances; and he was inclined to agree with Chæremon the Stoic that they also came as signs of future good, as in the instance of the birth of Christ.<sup>21</sup> Comets indeed he perhaps regarded as on a level with prophetic souls as channels of divine communication, since his view of all heavenly bodies was such, despite his censure of horoscopes-taking, that he might easily attribute excessive influence or power to them.

Celsus had censured the Jews and by implication the Christians for worshipping heaven and the angels, and even apparitions produced by sorcery and enchantment, and yet neglecting what in his opinion were the holiest and most powerful part of the heavens, the fixed stars and planets, "who prophesy to every one so distinctly, through whom all productiveness results, the most conspicuous of supernal heralds, real heavenly angels."<sup>22</sup> In reply Origen,

<sup>20</sup> Reply to Celsus, I, 66.

<sup>21</sup> *Idem*, I, 59.

<sup>22</sup> Reply to Celsus, V, 6. The following passage is quoted by Origen from Celsus. Πρῶτον οὖν τῶν Ἰουδαίων θαυμάζειν ἄξιον, εἰ τὸν μὲν οὐρανὸν καὶ τοὺς ἐν τῷ αἵματι ἀγγέλους σέβουσι. . . . ἢ τοὺς μὲν ἐν σκότῳ ποὺ ἐκ γοητείας οὐκ ὀρθῆς τυφλῶνται, ἢ δι' ἀμυνδρῶν φασμάτων ὀνειρώττουσιν ἐγχρίμπειν λεγόμενους, εὐ μάλα θρησκεύειν τοὺς δ' ἐναργῶς οὕτω καὶ λαμπρῶς ἅπασιν προφητεύοντας, . . . . δι' ὧν αὐτοῖς ἀνακαλύπτεσθαι τὸν θεὸν, τὸν

after exonerating Jews and Christians from any worship contrary to that of one supreme God, proceeded with equal pains to demonstrate that although they did not worship the stars they by no means slighted these. He knew, he said, that in general the stars had been assigned by God to all the nations beneath the heavens, but this system of astral satrapies did not extend to God's chosen people.<sup>23</sup> Neither he nor other Christians meant to hold with Anaxagoras that the stars were merely red-hot masses of matter, nor to assert that the heavenly bodies were subject to themselves.<sup>24</sup> He was prepared to grant, if necessary, that the stars were rational beings (*λογικὰ καὶ σπουδαῖα*) and had been "illuminated with the light of knowledge by that wisdom which is the reflection of everlasting light," and that they foretold many things, but even these facts were no reason for giving them the worship due to God alone, who was immeasurably superior even to these exalted spirits, and to whom sun, moon and stars themselves doubtless prayed.<sup>25</sup>

Augustine perhaps felt for the heavenly bodies much the same high respect as Origen manifested, if his assertion that those men insult the stars who impute to that most brilliant and resplendent senate the causing of evil upon the earth is not to be taken as a mere piece of rhetoric.<sup>26</sup> His discussion of matters astrological, however, is limited

φανερωτάτους τῶν ἄνω κήρυκας, τοὺς ὡς ἀληθῶς οὐρανίους ἀγγέλους, τοὺτους ἡγείσθαι τὸ μὴ δέν.

<sup>23</sup> *Idem*, V, 10. φήσομεν ὅτι ὁ Μωϋσέως νόμος ἐπίσταται τοὺτους ἀπονεμθέντας μὲν ὑπὸ τοῦ θεοῦ πᾶσι τοῖς ἔθνεσιν ὑποκάτω τοῦ οὐρανοῦ· οὐκέτι δὲ καὶ τοῖς εἰς ἐξαίρετον μερίδα ληφθεῖσι τῶν θεῶν παρὰ πάντα τὰ ἐπὶ γῆς ἔθνη.

<sup>24</sup> *Reply to Celsus*, V, 11. καὶ οὐκ ἀτιμάζοντές γε τὰ τηλικαῦτα τοῦ θεοῦ δημιουργήματα, οὐδ' Ἀναξαγορίως μύθρον διαπυρρον λέγοντες εἶναι τὸν ἥλιον καὶ σελήνην καὶ ἀστέρας.

<sup>25</sup> *Idem*, V, 10-12. καὶ ἐφωτίσθησαν τῷ φωτὶ τῆς γνώσεως ὑπὸ τῆς σοφίας, ἥτις ἐστὶν ἀπαύγασμα φωτὸς αἰδίου.

<sup>26</sup> *City of God*, V, 1. "...magnam cælo faciunt iniuriam, in cuius velut clarissimo senatu ac splendissima curia opinantur scelera facienda decerni..."

to several onslaughts upon the *genethliaci* or *mathematici* of his day; and whatever may have been his opinion of the stars, his attitude towards their would-be interpreters is by no means favorable, as many passages in his works show us.<sup>27</sup> A typical passage is the following from the *De Doctrina Christiana*:

“Nor are they to be excepted from the category of dangerous superstition who are called *genethliaci* from their scrutiny of the days of birth, and now are also spoken of colloquially as *mathematici*. For though they trace out the actual position of the stars when each person was born and even attain some results; yet in that they try to predict either one’s actions or the outcome of one’s actions they err too far and sell inexperienced men into a wretched slavery.”<sup>28</sup>

In his youth, when a follower of the Manichean sect, Augustine had been devoted to astrology and perhaps on this account frequently felt the more bound to warn his readers to have nothing to do with it. In the fifth book of *The City of God* he enters upon an elaborate argument.<sup>29</sup>

Augustine objected to astrology first because it was fatalistic, attributing to the stars a power possessed by God alone. Assuming, however, that some might remove this objection by arguing that the heavenly bodies simply signified but in no sense caused future events, he proceeded to advance the further objection that at the same moment of time several persons of different subsequent life and

<sup>27</sup> See Augustine’s collected works in Migne’s *Patrologiæ Latinae*, Vol. 32, col. 694, 707, 737, 1014; Vol. 33, col. 210; Vol. 34, col. 52, 472, 1455; Vol. 35, col. 456, 476, 747, 1821; Vol. 36, col. 76, 438; Vol. 37, col. 28; Vol. 38, col. 142, 147.

<sup>28</sup> *De Doctrina Christiana* Bk. II, Cap. 21. “Neque illi ab hoc genere perniciosæ superstitionis segregandi sunt, qui genthliaci, propter natalium dierum considerationes, nunc autem vulgo mathematici vocantur. Nam et ipsi quamvis veram stellarum positionem, cum quisque nascitur, consecentur, et aliquando etiam pervestigent; tamen quod inde conantur vel actiones nostras vel actionum eventa prædicere, nimis errant, et vendunt imperitis hominibus miserabilem servitutem.”

<sup>29</sup> See *City of God*, Book V, Chapters 1-7.

character might have been—indeed probably constantly were being—born under the same quarter of the heavens. Esau and Jacob were quite dissimilar in character and Augustine himself knew of twins who were of different sex and career. Moreover, he tells us in his “Confessions” that he himself was finally led to give up his study of the books of astrologers, from which the arguments of “Vindicianus, a keen old man, and of Nebridius, a youth of remarkable intellect,” had failed to win him, by hearing from another youth that his father, a man of wealth and rank, had been born at precisely the same moment as a certain wretched slave on the estate.<sup>30</sup>

Augustine proceeds to elaborate the argument from twins at considerable length, apparently borrowing his logic largely from Favorinus. He considers the objection that twins of dissimilar fate are after all not born at exactly the same instant. This he believes he sufficiently rebuts by the dilemma that the brief interval of time between the two births is either too trifling to account for such complete diversity of character and career as often results, or too important to permit such complete identity of family and rank or such resemblance in physical constitution and liability to disease as is the case. Moreover, if astrologers must take into account such small intervals of time, their predictions can never possess any certain accuracy.

<sup>30</sup> *Confessiones*, Bk. VII, Chap. 6. See also Bk. IV, Chap. 2 and 3, where Augustine tells that, though through his Manichean scruples against the sacrifice of animals he refused the offer of a haruspex to consult the future for him and insure him success in the poetical contest in which he was to engage at the theatre, yet he was all the time “sacrificing himself to the demons” through his belief in astrology.

The fact that the haruspex offered not to see who was going to win the contest but to make Augustine the winner is suggestive. Like Origen’s query why birds did not control their own fate if they knew the future, it shows that the diviners and astrologers did not make the human will the absolute slave of the flight of birds or courses of stars, but believed there were loopholes of escape for the man informed beforehand. Augustine quite ignores this fact in the ensuing argument.

But the astrologers may further object that the time of conception, identical for both twins, determines the qualities in which they are alike while the difference in time of birth regulates their dissimilarities. If this is so, replies Augustine, if a difference in time of birth can alter the future prescribed by the joint moment of conception,—scarcely a fair statement of the astrologers' argument—why also may not twins die at different dates or human free will triumph over the position of the constellation at birth as this in turn has modified the sidereal influence at the period of conception? Moreover, if the moment of conception is to govern the life of the child to be, why may not the father by consulting an astrologer beforehand as to a propitious time control the fate of his offspring and outwit the stars? And of what use is the astrological doctrine of elections—the choosing of propitious days for certain acts by consulting the stars—if one's entire fate has already been settled by the time of birth or conception?

Again if human beings alone are under the control of the stars, why do the *mathematici* name favorable days for setting out vines and trees and shrubs and for breeding cattle? But if vegetation and all animal life are governed by the stars, then each beast must have a separate time of birth from each seed or else we must expect the absurdity of seeds and beast being alike and experiencing the same fate. It is inconceivable, however, that many human beings and brutes and plants do not begin their respective careers, so utterly unlike, at the same instant. Furthermore it is plainly evident that grains are sown at the same time and germinate and ripen simultaneously, and yet meet very diverse fates.

Augustine by this somewhat piddling and sophistical variety of argument, in which the modern reader will readily discern weak points and evasions, disposed to his great satisfaction and not unlikely to the equally great discom-

future of his opponents, of the crude superstition that the time and place of birth and nothing else determine with mathematical certainty and mechanical rigidity the entirety of one's life. It was none the less a superstition which was evidently much alive, which the saint felt he must take great care to refute, and to which he himself had once been in bondage. Against a less narrow and hide-bound doctrine, a more practical and intelligent astrology, he does not argue. Exhausted from his arduous assault upon the enemy's first line, he rested his brain and pen and did not attempt to pursue farther the slowly retreating foe. But he made no truce with the enemy. He would not grant that the impulses of the mind were subject to the positions of the stars when even sex, a physical matter, might vary in twins born under the same constellations. Apparently the most he would concede was that it was not absurd to say that the influence of the stars might produce changes in material things, as in the varying seasons of the year caused by the sun's course and the alternating augmentation and diminution of tides and shell-fish due, as he supposed, to the moon's phases. That the astrologers often predicted the future in marvelous manner he admitted, but this success he attributed to the inspiration of evil spirits.<sup>31</sup>

To other stock modes of divination Augustine was apparently equally opposed, although he speaks in one place of the books of the aruspexes and augurs as a "somewhat more permissible vanity" than the worship of idols, entering into compacts with demons, or practising magic.<sup>32</sup> Hydromancy which Numa practised and which consists

<sup>31</sup> City of God, V, 7. "His omnibus consideratis non inmerito creditur, cum astrologi mirabiliter multa vera respondent, occulto instinctu fieri spirituum non bonorum, quorum cura est has falsas et noxias opiniones de astralibus fatibus inserere humanibus mentibus adque firmare, non horoscopi notati et inspecti aliqua arte, quæ nulla est."

<sup>32</sup> De doctrina Christiana, II, 20. "...Ex quo genere sunt, sed quasi licentiore vanitate, aruspicium et augurum libri."



of viewing the images or adumbrations of demons in water, is clearly a dangerous art and one foreign to the worship of the true God, Augustine declares. Even a pagan senate ordered Numa's books to be burned.<sup>33</sup>

Augustine's apparent freedom from superstition in his attitude toward the celestial bodies characterizes also his view of the natural world at large. He had, it is true, read his Pliny and Solinus and accepted on their authority some rather fantastic statements concerning the properties of material things, just as he quoted Hermes Trismegistus and Apuleius on such themes as the nature of demons. He recounts marvelous qualities of the magnet; asserts that adamant can be broken neither by steel nor fire but only by the application of goat's blood; tells us about Cappadocian mares conceiving from the wind; and hails with delight the salamander's ability to live in the midst of flames as a token that the bodies of sinners can subsist in hell fire.<sup>34</sup> Yet even in regard to such notions Augustine expresses a little hesitancy. Moreover, in his treatise on Christian doctrine he classified as superstitious all ligatures and remedies by means of incantations, characters and suspensions, which he said the medical art condemns and which have to do not with the physical condition but with "occult significations." Some people call them by the name *physica*, but they betray nature in so doing, as Augustine illustrates by giving several examples of superstitious observances.<sup>35</sup> He draws clearly and apparently quite consciously the dividing line between magic—in the broad sense—and science when he remarks,

"It is one thing to say, 'If you drink the juice of this herb, your stomach will not ache.' It is another thing to say, 'If you hang

<sup>33</sup> City of God, VIII, 35.

<sup>34</sup> City of God, XXI, 4, 5.

<sup>35</sup> De Doctrina Christiana, II, 20.

this herb from your neck, your stomach will not ache.' For the one prescription is to be approved as a medicinal application; the other is to be censured as superstitious ceremonial."<sup>36</sup>

Augustine deserves much credit for presenting this homely distinction as a sort of mental guide-post to the world of Christian believers; and one might moralize over the pleasing sight of the great theologian of the early Church leaving for a moment his homilies and commentaries to step to the aid of erring ancient science and to direct its march from the ambush of magic into the safe highway of rational attitude, were it not for a strong suspicion that he copied this same homely distinction from the pages of some pagan writer.

The question of the power of names which so interested Origen is not discussed by Augustine, unless he meant to condemn it as theurgy. But towards belief in the occult significance of numbers he displays a leaning. Six was a perfect number in his estimation, for God had created the world in six days although he might have taken more or less time; and the Psalmist made no idle remark in saying that Deity had ordered all things according to measure, number and weight. Also six is the first number which can be obtained by adding together its factors, one, two and three.<sup>38</sup> Augustine was going on to say that seven was also a perfect number, when he checked himself lest he digress at too great length and seem "too eager to display his smattering of science" and merely added that one indication of seven's perfection was the fact that it was com-

<sup>36</sup> De Doctrina Christiana, II, 29. "Aliud est enim dicere, Tritam istam herbam si biberis, venter non dolebit; et aliud est dicere, Istam herbam collo si suspenderis, venter non dolebit. Ibi enim probatur contemporatio salubris, hic significatio superstitiosa damnatur."

<sup>37</sup> City of God, Bk. X, Chap. 9, 10.

<sup>38</sup> *Idem*, XI, 30. Augustine may seem to have overlooked four, but he probably would have regarded its "parts" as one, two and two.

posed of the first complete odd number, three, and the first complete even number, four.<sup>39</sup>

Both Origen and Augustine were strong supporters and practitioners of allegorical interpretation, which was at least a sort of literary magic. Celsus, Origen remarked, admitted that not merely the uncultured were attracted to the Christian religion but also "moderate and reasonable and intelligent men, and ones apt at allegory,"<sup>40</sup>—a qualification which he apparently regarded as the very cap-stone of culture. Augustine declared that Noah's ark typified the body of Christ, since its proportions were those of the human body, while the door in its side through which the family of the righteous Noah walked in along with such of the animals as were to be saved was emblematic of the spear wound in the side of the Crucified whence flow the sacraments by which believers enter the kingdom. This kingdom, moreover, or at least the city of God sojourning in this world was foreshadowed by the ark, for was not the Church ransomed by the *wood* of the cross? The ark's squared timbers gave promise of the unshaken firmness of God's saints. Its three stories typified faith, hope and love; and probably also had reference to the spiritual harvests of thirty, sixty and one hundred-fold which result respectively from chaste marriage on the ground floor, chaste widowhood on the upper, and chaste virginity on the hurricane deck.<sup>41</sup>

<sup>39</sup> City of God, X, 31. "De septenarii porro numeri perfectione dici quidem plura possunt; sed et liber iste iam prolix est et vereor ne occasione conperta scientiolam nostram leviter magis quam utiliter iactare velle videamur. Habenda est itaque ratio moderationis adque gravitatis, ne forte, cum de numero multum loquimur, mensuram et pondus negligere iudicemur. Hoc itaque satis est admonere, quod totus impar primus numerus ternarius est, totus par quaternarius; ex quibus duobus septenarius constat."

<sup>40</sup> Reply to Celsus, I, 27. ὁμολογεῖ γὰρ καὶ μετρίους καὶ ἐπιεικεῖς καὶ συνετούς τινας καὶ ἐπ' ἀλληγορίαν ἐτοίμους εἶναι ἐν αὐτοῖς.

<sup>41</sup> City of God, XV, 26.

To sum up, Origen and Augustine furnished a conception of magic which was generally accepted in succeeding centuries. They believed perhaps more firmly than some educated pagans did that there was such a thing as magic. Their disapproval of the supposed art was no more violent and whole-souled apparently than the condemnation of it by most educated pagans. If an Apuleius, exculpating himself from the so-called magic practised by the vulgar crowd, extolled the true magic, as he would have it, of Persia; so an Origen while warning the mass of Christians that they were to leave magic entirely alone, could speak of a magic of the sage as on a plane with theology. Augustine's more uncompromising hostility was probably due in part to his geographical location farther away from the attraction of fantastic Oriental lore, in part to having more centuries of Christian habits and prejudice behind him.<sup>42</sup>

But while Origen and Augustine believed in magic and condemned magic in much the old accustomed way of the respectable citizen from time immemorial, the fact that magic meant to them something different from what it had before gave a new outcome to their belief and condemnation. Magic they regarded as evil not merely because it was employed to injure men and to take away from them liberty of action, but because it employed the services of spirits who were hostile to God. Any dealings with such spirits, whether the evil sorcerer's bewitching or the benevolent physician's charms or the Neo-Platonist's effort at soul satisfaction, were magic. Most arts of divination which had been sanctioned by pagan religions and science were now condemned. The casting of horoscopes was de-

<sup>42</sup> Yet his contemporary, Synesius, Bishop of Ptolemais, passed immediately from being a Neo-Platonist and lover of the occult to the position of a Christian bishop and apparently did not surrender in his new office his beliefs that the scientist could profit by considering the ways of the wizard and that by dreams and the stars men could read their future.

nounced, not merely in the way which Favorinus, Sextus Empiricus and Cicero had denounced it, as unsystematic, inaccurate and unscientific, but as probably involving the aid of evil spirits. Thus under the name "magic" Christianity condemned many more things than had the pagan world.

In those beliefs which neither they nor pagans included under magic but which seem to us to-day to border closely thereon, our authors show that the Christian attitude differed little from the pagan. Augustine, it is true, except in the realm of allegory and of number where his common sense abandons him, seems to refuse to believe in the unnatural and fantastic unless a spiritual force can be made to account for it. Even at that his rationalism is no more remarkable than that of Cicero who nearly five hundred years before had argued against astrology and augury with equal acumen and coolness. Had Augustine, moreover, like Pliny, been brought face to face with the vast accumulation of data handed down by past "scientists" in support of the unnatural and the fantastic, he might like Pliny have made ruinous exceptions to his theoretical scepticism. Had he like Origen fed his mind on the lore of the Orient, he might like him have been on occasion not inhospitable to the occult. For it seems true that he who drank too deeply of the learning of those days was liable to become mentally intoxicated, and that the student of "science" of that age who tried to make detailed statements about particular things was more open to error and magic than the rhetorician, logician or theologian who contented himself with making general assertions. Yet of course for such concrete details men continued to look to the student of "science." It is perhaps worth keeping in mind, moreover, that Origen and Augustine were both clerics and apologists and so professionally bound to take up an irreproachable position morally and dogmatically.

The average lay Christian mind may have been more easy-going in its attitude toward magic and superstition.

Worthy of notice though scarcely to be treated in the present discussion are the references of our authors to the fantastic beliefs of non-Christians, the Stoics and Pythagoreans and Platonists, and the astrology-mad world of their own times. Especially interesting are the beliefs of Celsus as set forth by Origen, who nevertheless hints that Celsus had written a treatise against magic.

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## A ROMAN ASTROLOGER AS A HISTORICAL SOURCE: JULIUS FIRMICUS MATERNUS

BY LYNN THORNDIKE

During the Italian Renaissance astrological treatises were thought as important as other classical writings, and were frequently printed. As astrology came to be considered a worthless delusion, they were forgotten or were stigmatized as spurious writings when encountered among the works of well-known authors like Ptolemy and Lucian. Today the importance of the magical and astrological writings of the ancient world, if only because of their bulk, has been again recognized. Greek papyri filled with magic texts are being brought to light and published; many dissertations on ancient superstition have appeared. The revived interest in classical astrology is seen, not only in such a work as Bouché-Leclercq's *L'astrologie grecque*,<sup>1</sup> but also in the *Catalogus Codicum Graecorum Astrologorum*,<sup>2</sup> a series of volumes now appearing in which a group of European scholars are co-operating under the leadership of Professor Franz Cumont in providing a guide to the many astrological manuscripts in European libraries. Besides this, in recent years several astrological treatises have been edited and published separately. In fact, the movement has advanced so far that already German scholars are busy in detecting in those astrological writings which are extant their indebtedness to, and dependence on, earlier works which we no longer possess.<sup>3</sup> The value of astrological books to the student of ancient religions,<sup>4</sup> or indeed of the whole mental life of the times, is being appreciated; and the influence of astrology

<sup>1</sup> Paris, 1899, 658 pp., illus. One might also note De la Ville de Mirmont, *L'Astrologie chez les Gallo-Romains*, Bordeaux, 1904.

<sup>2</sup> Brussels, 1898-.

<sup>3</sup> See articles by W. Kroll in the *Catalogus*, and F. Boll, "Studien über Claudius Ptolemaeus," *Jahrb. f. kl. Philol.*, Suppl. XXI (1894), 49-244.

<sup>4</sup> See Cumont, *Astrology and Religion among the Greeks and Romans*, New York, 1912; or his briefer chapter on "Astrology and Magic" in his *Oriental Religions in Roman Paganism*, Chicago, 1911.



upon the form of history in the Middle Ages has been interestingly discussed by F. v. Bezold.<sup>1</sup>

I intend to show that an astrological treatise may also give us a picture of past society and thus contribute to the content of history. The point is that in trying to predict the future the astrologers really depict their own civilization. Their scope is as broad as are human life and human interests. Slave and artisan are dealt with as well as emperor and philosopher, and the astrologer can boast with Juvenal

*quidquid agunt homines, votum timor ira voluptas  
gaudia discursus, nostri farrago libelli est.*

Indeed the astrological poet Manilius does boast, proudly contrasting his art to the fictions and sentimentalities of other poets:

It embraces every sort of fact, every effort, every achievement, and every art, that through all the phases of human life may concern human fate; and it has disposed these in as many varied ways as there are positions of the stars; has attributed to each object definite functions and appropriate names; and through the stars by a fixed system has ordained a complete census of the human race.<sup>2</sup>

Nor is astrology prone to that usual failing of historical records, the omission of what is obvious at the time of writing, since it deals in futurities which are never obvious and must be explicitly predicted.

But what is the historical reliability of astrological works? We must not think of them as compositions by ignorant quacks and impostors for a credulous and inferior minority of the public, full of extravagant promises and terrifying threats. Practically everyone believed in astrology; learned men wrote treatises on the art, which took itself with great seriousness and prided itself upon its scientific methods. Moreover, in an astrological handbook there was almost no occasion for the personal or party prejudice of so many professed historians, or for the satiric bias of a Juvenal. Even Christian and pagan wrote much alike on this theme. "The complete census of the human race" supplied by an astrologer is unsystematic perhaps, and may be more meager than his pretentious prospectus leads one to expect, but it seems to have the merit of being a naïve, unconscious, largely objective and sincere picture of his

<sup>1</sup> *Deutsche Zeitschrift für Geschichtswissenschaft*, VIII (1892), 29 ff.

<sup>2</sup> *Astronomica* III. 67.

own age. There is, however, one difficulty. Does the author really picture his own society, or are his topics, which we suppose to represent the structure of contemporary civilization, merely traditional categories long fixed by the rules of his art? and are the details of his subject-matter his own intelligent adaptation of the general principles of his art to present conditions, or are they slavishly copied from earlier manuals? This question must be determined in each particular case largely from internal evidence.<sup>1</sup>

This article will consider the third and fourth books of the *Mathesis* of Julius Firmicus Maternus as a specific instance of how an astrological treatise may be utilized as a historical source. Firmicus lists various constellations, and states under each its effects upon men born under it. This introduces a quantitative element, since the same phenomenon may be mentioned under several constellations; and one naturally assumes that those matters to which Firmicus devotes most space and emphasis are the most prominent features of his age. Therefore an analysis of his *apotelesmata* (i.e., "effects") should give us a description and to some extent a measurement of fourth-century civilization.

The *Mathesis* contains eight books, but the first two are introductory and not devoted to *apotelesmata*, while the last four have not yet appeared in a critical edition.<sup>2</sup> They do not rest on as early manuscripts as the other books, while the old printed editions of 1497 and 1499 differ considerably, and more than is stated by Boll

<sup>1</sup> Thus the first two books of Hephaestion of Thebes (Engelbrecht, *Hephästion von Theben und sein astrologisches Compendium*, Vienna, 1887) simply reproduce Ptolemy's *Tetrabiblos*. But Guido Bonatti, a thirteenth century astrologer (*Liber astronomicus*, Augsburg, 1491, 422 fols.), though he cites the ancients, evidently writes for and of his own age, replying to arguments of contemporary theologians against astrology; instructing how to determine whether the candidate for a position as abbot, bishop, or cardinal, will secure the coveted office, and how to find the most auspicious hour for laying a church corner-stone; and mentioning sugar, unknown to the ancient world.

<sup>2</sup> The editions of the *Mathesis* are as follows: Iulii Firmici Materni Matheseos Libri VIII ediderunt W. Kroll et F. Skutsch. Fasciculus prior libros IV priores et quinti prooemium continens. Lipsiae, 1897, 280 pp.; Julius Firmicus de nativitatibus. . . . Impressum Venetiis per Symonem sapiensem dictum bivilaque, 1497 die 13 Iunii, CXV fols; Iulii Firmici Astronomicorum libri octo integri et emendati ex Scythicis oris ad nos nuper allati. . . . Venetiis cura et diligentia Aldi Ro. Mense octob. MID. The Basel editions of 1533 and 1551 by M. Pruckner reproduce the Aldine text. The references throughout this article are to the page and line of Kroll-Skutsch; the second fascicle has recently been published.

in Pauly-Wissowa—for instance, over one-third of Book v in the Aldine edition (pp. 194–214) is omitted in the *editio princeps*.<sup>1</sup> Moreover, although these four books cover more pages than the other two, they do not supply so many details nor so satisfactory a picture of human society. These divergences, mainly ones of omission, do not invalidate the results gained from the third and fourth books, but do raise the question whether the later books, especially the fifth and sixth, were written by Firmicus. In them the wording becomes vaguer, little knowledge is shown of conditions at the time that Firmicus wrote, the predictions are more sensational and rhetorical. Only the latter portion of the eighth book carries the conviction of reality that books three and four do. These two books are both independent units and supply a general picture of human life.

Firmicus flourished during the reigns of Constantine the Great and his sons.<sup>2</sup> Sicily was his native land; he was of senatorial rank and very well educated for his time, showing interest in natural philosophy, literature, and rhetoric. He writes on astrology at the request of a similarly cultured friend, Lollianus or Mavortius, who had held various important governmental posts. Firmicus is also the author of a work *On the Error of Profane Religions*,<sup>3</sup> addressed to Constantius and Constans, and urging them to eradicate pagan cults. The writing of two such books by one man has long given critics pause, and is a splendid warning against taking anything for granted in our study of the past. The assertion of Boll that “there is no question but that he was a pagan when he wrote his book on astrology”<sup>4</sup> seems to me overconfident; but whatever the personal convictions of the author of the *Mathesis* may have been, it is certain that Christianity has made little impression upon his *apotelesmata*. On the other hand, in his Christian work he not only never attacks astrology, but he criticizes certain pagan cults as sharply for their incorrect physical notions as he does others for their travestying of Christian mysteries, while his allusions to the planets, among

<sup>1</sup> I regard these additions in the Aldine as spurious.

<sup>2</sup> For bibliography of Firmicus see Boll's article "Firmicus" in Pauly-Wissowa.

<sup>3</sup> A more critical edition than that in Migne is by Konrat Ziegler, Leipzig, 1907.

<sup>4</sup> Pauly-Wissowa, VI, 2365.

which is a representation of the Sun making a reproachful address to certain pagans,<sup>1</sup> indicate that he still regarded the stars as of immense importance in the administration of the universe. Moreover, as before, he sets the emperors above the rest of mankind and closely associates them with the celestial bodies and "the supreme God."<sup>2</sup>

Do Firmicus' *apotelesmata* apply to his own century or are they copied from earlier writers? He uses words and phrases that are evidently from the Greek; he frequently mentions authorities, especially the Greeks and "the divine men of Egypt and Babylon"; and regards himself as rendering available for the Latin-speaking world an art which their writers (so he says) have hitherto neglected. Consequently recent investigators of classical astrology have been trying to discover the nature of these earlier writings and to make out how far their contents are preserved for us in the *Mathesis*. Thus far sources have been discovered or suggested only for limited

<sup>1</sup> Ziegler, p. 23.

<sup>2</sup> Compare Kroll-Skutsch, p. 86, with Ziegler, p. 53. Consequently the date of writing the *Mathesis* should be determined without any assumptions as to Firmicus' religion; and I am inclined to dispute Mommsen's contention (*Hermes*, XXIX, 468-72) that "it is beyond doubt" that the *Mathesis* was written between 334 and 337 A.D. To accept this conclusion it is necessary to explain away the mention of Lollianus as *ordinario consuli designato* (Kroll-Skutsch, 3, 27), an office which he held in 355. I think that it is preferable to explain away the apparent mentions of Constantine the Great, upon which Mommsen laid so much stress. The names, Constantine and Constantius, are frequently confused in the sources, and the expression "Constantinus scilicet maximus divi Constantini filius" (37, 25) might as well be read "Constantius, son of Constantine" as "Constantine, son of Constantius." The words "Constantinum maximum principem et huius invictissimos liberos, dominos et Caesares nostros" seem to refer unmistakably to Constantine, but they occur in a prayer to the planets and to the supreme God that Constantine and his children may "rule over our posterity and the posterity of our posterity through infinite succession of ages." As this is simply equivalent to expressing a hope that the dynasty may never become extinct, there seems no reason why the passage should not be left unaltered in a book published after the death of Constantine.

Moreover, Firmicus explicitly states that the writing of his book has been long delayed (1, 3 and 3, 19), and it is evident that he and his friend were scarcely young when the promise to compose the *Mathesis* was first made. Lollianus was then *consularis* of Campania and, according to inscriptions, had already held a number of offices. Firmicus would frequently give up his task in despair, but then Lollianus would urge him on again. Having become "Count of all the Orient," he continued his importunities, until at last when he was proconsul and ordinary-consul-elect the book was finished and presented to him. Meanwhile Firmicus had retired from public life. Yet we are asked to believe, not merely that he writes a vehement invective against profane religions a decade later, but also that, twenty years after, his friend is still a vigorous administrator and praetorian praefect (Ammianus Marcellinus xvi. 8. 5).

portions of the *Mathesis*, and chiefly in other books than iii and iv, and in these cases it is evident that Firmicus has made additions and alterations and is no mere copyist.<sup>1</sup>

The criticism has been made, however, that where Firmicus is most original he is too rhetorical. Boll asserts that he breathes "the sensational atmosphere of the schools of rhetoric" and of the Pseudo-Quintilian declamations, and that "all the far-fetched calamities which in his pages continually menace mankind reveal the fearful weight with which this superstition afflicted human minds."<sup>2</sup> But "far-fetched calamities" in that day did not merely lurk in superstitious minds, they were perpetrated in the full glare of publicity. If Firmicus predicts death by being thrown to wild beasts, we must remember that even Constantine's panegyrist recounts how he had thrown Frankish chiefs into the arena at Trier and "wearied the raging beasts by the multitude" of victims.<sup>3</sup> Moreover, it is in the later books that Firmicus is most sensational. Death by beasts is mentioned nineteen times in Book viii, only once in Books iii and iv. Furthermore, he is, if anything, more rhetorical in describing contemporary facts, such as his personal experiences or the pagan practices which he attacks in the *De errore*, than in predicting future possibilities. Consequently his rhetoric is no proof of unreality. Rather, if he were entirely unrhetoical, would he leave us with a false impression of his age. Finally, our method of statistical analysis will have the tendency to separate such chaff from the wheat of historical truth. Ideas will be counted rather than words, and only those passages included where Firmicus evidently has some distinct idea in his own mind and makes an express prediction.

The space limits of the present article permit only a summary of the chief results of my analysis rather than a complete exposition of it; and allow specific references in the footnotes only for those passages which are quoted, instead of for all that are enumerated, as I had planned. But I hope that the reader will get a fairly clear idea of the method employed as well as of the historical information gained thereby.

<sup>1</sup> See Boll, *Sphaera*, 401; Kroll in the *Catalogus*, II, 159; V, 2, 143.

<sup>2</sup> Pauly-Wissowa, VI, 2373.

<sup>3</sup> *Paneg.* vii. 10-12; Eutropius x. 3.

Firmicus makes more allusions to public life than to any other human activity. This is appropriate in a Roman writer, especially under the bureaucratic paternalism of Diocletian and Constantine. A number of predictions refer unmistakably to their system of government, showing that Firmicus has not heedlessly copied the *apotelesmata* of earlier astrological handbooks, but has interpreted the influences of the stars to fit his own age. He mentions praetorian praefects, *vicarii* (rulers of dioceses), *praesides* (provincial governors), *decemprimi* (governing boards of municipalities), and *curiosi* (special officials connected with the imperial post).<sup>1</sup> He is accurate in saying *scutarios vel protectores imperatorum*, since the *protectores* were originally largely selected from the *scutarii*. He correctly alludes to *cornicularii* and *commentarienses* as bureaucratic officials connected with the administration of criminal justice, though in earlier times these were military offices, and his juxtaposition of the two names is duplicated in the inscription of Lambesia and in Pseudo-Asconius. He mentions *discussio*, the revision of the public accounts in vogue in the late imperial period and cited in Harpers' dictionary from no earlier sources than Symmachus and Justinian. He also speaks of *discussores rationales*, although Seeck in Pauly-Wissowa states that the title *discussor*, "employed since the fourth century A.D. for officials of very different kinds," but with the common characteristic of being extraordinary inspectors connected with the treasury, occurs first in 368 A.D. (*Cod. Theod.*, VIII, 15, 5).<sup>2</sup>

Besides a great number of vague predictions of political life or mentions of well-known magistracies,<sup>3</sup> due attention is given to

<sup>1</sup> *Praesides*, in 4 passages; *decemprimi*, in 5; the others once or twice each. None of these offices is mentioned in the other books of the *Mathesis*.

<sup>2</sup> Kroll-Skutsch, 136, 28; 172, 22; 180, 19.

<sup>3</sup> Administration and administrators, 28 passages; emperors, 8; those concerned with the affairs of emperors or of great men, 4; friends of, known to, or in favor with, emperors and powerful men, 8; rule of the whole world, 5; kings, 29; *fascies* and consular rank, 12, including proconsuls, 8, and *consules ordinarii*, 3; rulers set over great cities or provinces, 18; magistrate of a small place or single city, 3; possessing the *imperium*, 3; ambassadors, 3; messengers, 6; "public acts," 9; public honors and popular favor, 6; *coronati*, 8; those who sell their lives to kings or to powerful men *vittii cuiusdam causa*, 1.

One reference to "overthrowers of emperors," if not also the 8 predictions that persons will become emperors, is inconsistent with the statement made earlier that the emperor alone is not subject to the stars, since as lord of the whole world his fate is

Roman law.<sup>1</sup> Indeed Firmicus states that he himself had formerly "resisted with unbending confidence and firmness" factious and wicked and avaricious men, "who from fear of law-suits seemed terrible to the unfortunate"; and that "with liberal mind, despising forensic gains, to men in trouble. . . . I displayed a pure and faithful defense in the courts of law." By this upright conduct he incurred much enmity and danger.<sup>2</sup> In allusions to military affairs generals are mentioned twice as often as soldiers; and while the latter are once called "glorious soldiers" and promised promotion and happiness, in other passages we hear of "miserable soldiers" and "the everlasting burden" of military service.<sup>3</sup> The matter of finance, so prominent in the declining empire, receives due recognition. At least thirty passages have to do with public finance, which receives as much attention and more specific description than private banking and commerce.<sup>4</sup> The two seem closely connected and successful business men are likely to be drawn into public finance. Economic paternalism is suggested by such phrases as "public wares," "public arts but hidden and miserable," "public artificers," "superintendents of the royal weaving establishments." Public games and state education are mentioned.<sup>5</sup> Deposition from power, failure to remain in office, imperial disfavor, exile, captivity, or violent death are occasionally mentioned as the fate of men engaged in

directly determined by the supreme God and he "is numbered among those gods whom the principal divinity has established to make and maintain everything" (Kroll-Skutsch, 86, 19).

Kroll (*Catalogus*, V, 2, 148) thinks the frequent mention of kings an indication of use of Hellenistic works, and does not believe it likely that "the kings of the Bosphorani, Armenians, or Parthians, and such monarchs" are meant. Yet when Constantine made his three sons Caesars, he created a kingdom in Asia for his nephew Hannibalianus, and one source states that he was given the title "king of kings." And we have already heard a panegyrist of Constantine apply the term *reges* to Frankish chiefs.

<sup>1</sup> Judges, 19; judicial assessors, 1; jurists, 7; advocates, 5; notaries, court reporters, scribes, etc., 7.

<sup>2</sup> Kroll-Skutsch, 195, 3 ff.

<sup>3</sup> Military leaders (usually *duces*), 41; soldiers, 16.

<sup>4</sup> *Fiscus*, 9; tax collectors (*exactores*, *vectigaliarii*, and *publicani*), 4; farming of the taxes (*conductio*), 4; *procuratores*, 4; *rationales*, 3; public accounts, 4; intrusted with royal treasure or deposits by foreign nations, 5; *annonae*, 5; *horrea*, 2.

<sup>5</sup> There are also allusions to imperial tutors, private secretaries, and men of letters, and to pleasure-makers to royalty.

politics. Once elevation to a dignified public position is promised to men of the lower classes (*iacentes homines et abiectos*), but only after great toil, obstruction, and sacrifice of property.

To religion Firmicus gives much less space than to politics. There are no clear references to Christianity, but there are few allusions to any particular cults. Firmicus, however, indicates the existence of many cults, speaking five times of the heads of religions, and characterizing men as "those who regard all religions and gods with a certain trepidation," "those devoted to certain religions," "those who cherish the greatest religions," and so on. Temples,<sup>1</sup> priests, and divination<sup>2</sup> are the three features of religion that he mentions most. Magic and religion are closely associated in his predictions, for instance, "temple priests ever famed in magic lore." Sacred or religious literatures and persons devoted to them are mentioned thrice, while in a fourth passage we hear of men "investigating the secrets of all religions and of heaven itself." Other interesting descriptions<sup>3</sup> are of those who "stay in temples in an unkempt state and always walk abroad thus, and never cut their hair, and who would announce something to men as if said by the gods, such as are wont to be in temples, who are accustomed to predict the future"; and of "men terrible to the gods and who despise all kinds of perjuries. Moreover, they will be terrible to all demons, and at their approach the wicked spirits of demons flee; and they free men who are thus troubled, not by force of words but by their mere appearing; and however violent the demon may be who shakes the body and spirit of man, whether he be aerial or terrestrial or infernal, he flees at the bidding of this sort of man and fears his precepts with a certain veneration. These are they who are called exorcists by the people." Religious games and contests are mentioned four times: the carving, consecrating, adoring, and clothing of images of the gods, twice each; porters at religious ceremonies, thrice; hymn singers, twice;

<sup>1</sup> Temple-robbers, 5; servile or ignoble employ in temples, 5; spending one's time in temples, 4; builders of temples, 3; beneficiaries of temples, 3; temple guards, 2; *neocori*, 3; and so on, making 35 references to temples in all.

<sup>2</sup> Chief priests, 5; priests, 9; of provinces, 1; priestess, 1; priests of Cybele (*archigalli*), 3; Asiarchae, 1; priest of some great goddess, 1; illicit rites, 1. There are 27 passages concerning divination.

<sup>3</sup> Kroll-Skutsch, 148, 8 and 123, 4.



pipe-players once. Five passages represent persons professionally engaged in religion as growing rich thereby.

We are told that men "predict the future either by the divinity of their own minds or by the admonition of the gods or from oracles or by the venerable discipline of some art."<sup>1</sup> Augurs, aruspices, interpreters of dreams, *mathematici* (astrologers), diviners, and prophets are mentioned. Once Firmicus alludes to false divination but he usually implies that it is a valid art.

From religion and divination we easily pass to the occult arts and sciences, and thence to learning and literature in general, from which occult learning is scarcely distinguished in the *Mathesis*. Magicians or magic arts are mentioned no less than seven times in varied relations with religion, philosophy, medicine, and astronomy or astrology, showing that magic was not invariably regarded as evil in that age, and that it was confused and intermingled with the arts and philosophy as well as with the religion of the times.<sup>2</sup> There are a number of other allusions to secret and illicit arts or writings; these, however, appear to be more unfavorably regarded and probably largely consist of witchcraft and poisoning.

The evidence of the *Mathesis* suggests that the civilization of declining Rome was at least not conscious of the intellectual decadence and lack of scientific interest so generally imputed to it. We find three descriptions of intellectual pioneers who learn what no master has ever taught them, and one other instance of men who pretend to do so. We also hear of "those learning much and knowing all, also inventors," and of those "learning everything," and "desiring to learn the secrets of all arts." This curiosity, it is true, seems to be largely devoted to occult science, but it also seems plain that mathematics and medicine were important factors in fourth-

<sup>1</sup> Kroll-Skutsch, 201, 6.

<sup>2</sup> Cumont says (*Oriental Religions in Roman Paganism*, p. 188): "But the ancients expressly distinguished 'magic,' which was always under suspicion and disapproved of, from the legitimate and honorable art for which the name 'theurgy' was invented." This distinction was made by Porphyry and others, and is alluded to by Augustine in the *City of God*, but it is to be noted that Firmicus does not use the word 'theurgy.' Cumont also states (p. 179) that in the last period of paganism the name philosopher was finally applied to all adepts in occult science. But in Firmicus, while magic and philosophy are associated in two passages, there are five other allusions to magic and three separate mentions of philosophers.

century culture as well as the rhetorical studies whose rôle has perhaps been overestimated. Let us compare the statistics. Oratory is mentioned eighteen times, and it is to be noted that literary attainments and learning as well as mere eloquence are regarded as essential in an orator. Men of letters other than orators are found in six passages, and poets in only three. A passage reading "philologists or those skilled in laborious letters" suggests that four instances of the phrase *difficiles litterae* should perhaps be classed under linguistic rather than occult studies. There are four allusions to grammarians and two to masters of grammar, as against one description of "contentions, contradictory dialecticians, professing that they know what no teaching has acquainted them with, mischievous fellows, but unable to do any effective thinking."<sup>1</sup> On the other hand, there are fourteen allusions to astronomy and astrology (not including the *mathematici* already listed under divination), three to geometry, and six to other varieties of mathematics.<sup>2</sup> Philosophers are mentioned five times; practitioners of medicine, eleven times;<sup>3</sup> surgeons, once; and botanists, twice. These professions seem to be well paid and are spoken of in complimentary terms.

That education was still widespread is indicated by eighteen mentions of masters, while one phrase suggests educational administration.<sup>4</sup> In two cases where men are said to be strangers to letters they are once diseased and once "of accursed mind."

From the numerous references to music<sup>5</sup> and athletics<sup>6</sup> we infer that they were still prominent features of ancient culture and education. On the other hand, relatively little is said of the stage,<sup>7</sup> and the sole allusion to gladiators describes them as "those who

<sup>1</sup> Kroll-Skutsch, 161, 26.

<sup>2</sup> *Computus*, 3; *calculus*, 2; and "those who excel at numbers," 1.

<sup>3</sup> Including two mentions of court physicians (*archiatri*). See *Codex Theod.*, Lib. XIII, Tit. 3, *passim*, for their position.

<sup>4</sup> There are 7 vague allusions to *disciplina*, *doctrina*, and *sophia*.

<sup>5</sup> Sixteen or 17 in all, including 4 about instrument-makers or -players, 2 concerning composers, 4 in which music is described as a source of pleasure or as evoking admiration and public honors.

<sup>6</sup> Athletes, 10; lovers of athletes, 1; masters of athletes, 1; *palaestrae* and gymnasiums, 7.

<sup>7</sup> Jugglers, mimes or dancers, actors and actresses are mentioned once each.

perish by an atrociously cruel death in the sight of the people."<sup>1</sup> Firmicus is far from regarding travel as an amusement, and often speaks of its dangers or inconveniences.<sup>2</sup>

Professor Dill has pointed out that it is "curious to note how small a part of the Theodosian Code is devoted to the subject of trade and commerce." He thinks that "the *negotiatores* were in the fifth century probably on a much lower social level than the humblest landed proprietor," and he says that "if fortunes were accumulated in commerce, they have left few traces in the pages of the Code." A reason for this, he believes with other historians, is that "the wars and social confusion of the latter part of the third century gave a shock to commerce from which it never recovered."<sup>3</sup> The predictions of Firmicus scarcely substantiate these statements. He does not, it is true, devote very many passages to commerce,<sup>4</sup> but he says nothing to indicate that the lot of the *negotiator* is a hard or a low one. Rather he mentions it as a path to wealth or to important public positions, and several times gives financiers a high intellectual character. Guardians and agents of persons and property are mentioned in eighteen passages.

Firmicus appears also to have considerable respect for artists and artisans,<sup>5</sup> and draws no sharp distinction between the fine arts and other industries. Architects, sculptors, painters, and mosaic-makers are mentioned, and art still seems to be largely in the service of religion. Five passages listing goldsmiths, gilders, those who adorn garments with gold, workers in gold leaf, and silversmiths, and describing them as normally prosperous, are of interest in view of the fact that in this period only copper coins were in circulation,

<sup>1</sup> Kroll-Skutsch, 121, 20.

<sup>2</sup> In 10 out of 30 passages.

<sup>3</sup> Dill, *Roman Society in the Last Century*, 246-47.

<sup>4</sup> Those in charge of accounts, 6; accounts, 3; *negotiatio*, 16; *fenus*, *feneratio*, etc., 7; *mensae*, 3; sureties, guards of money, and secreters of money, twice each; and other vague allusions.

<sup>5</sup> *Artifices*, as well as priests, magicians, and physicians, are among those "who gain their livelihood by these arts and possess such genius that they learn by themselves what no training of a master has transmitted to them." All through the *Mathesis* Firmicus speaks of God in the creation of man as an *artifex*, and in the *De errore* also mentions "the supreme God who composed all things with the moderation of divine artifice" (Ziegler, p. 5).

and the coinage almost hopelessly debased. There are many references to lapidaries and dealers in precious stones (8 passages), to pigments (8), aromatics (8), dyers (7), those who find or invent colors (3), sellers of unguents (2), pharmacists (1), and medicaments (1). All this suggests the painted courtesan, and one is somewhat surprised at these indications of highly colored and highly scented luxury in an age of approaching political and economic decline and of Christian and ascetic growth.

The following are other occupations, arranged according to the frequency with which Firmicus mentions them: "arts concerned with fire and iron" (12); cooks and tavern-keepers (7); fishermen, tanners, and guards of sepulchers (5); embalmers, gardeners, and pilots (4); makers of tunics, manufacturers of linen, farmers, hunters, keepers of wild beasts, shipowners, and those who draw water from deep wells (3); workers in wool, in bronze, in other metals, miners, fullers, shoemakers, millers or bakers, undertakers, flower-sellers, cattle fanciers, cowherds, shepherds, grooms, fowlers, sailors, water-carriers (2); weavers, diggers of gold, "mechanics," turners, wine merchants, makers of articles for feminine use who are welcome in palaces, swineherd, stable boy, keeper of the royal animals, those who clean drains (1).

Firmicus also occasionally describes the conditions attending different occupations, speaking, for example, of "illustrious and noble arts from fire and from iron, and arts that are brought to the notice of all by the famous stamp of nobility," and again of arts which "will be either sordid or squalid or involving disagreeable stench, or ones in which constant vigilance is demanded of the workmen."<sup>1</sup> Of nine vague allusions to "acts about water" and aquatic employment, five stigmatize that mode of life as laborious; and one mention of "unceasing labors about water" is immediately followed by a more specific description of "day laborers devoted to unremitting toil and who are wont to hire out their bodies for some job, earning a living by carrying loads on their backs and shoulders."<sup>2</sup> In this connection we may note that the expression *urinatores aquas ex altis puteis levantes* indicates that *urinator* does not always mean "a diver."<sup>3</sup>

<sup>1</sup> Kroll-Skutsch, 261, 3 and 166, 28.

<sup>2</sup> *Ibid.*, 224, 22.

<sup>3</sup> *Ibid.*, 168, 18.

The treatment of agriculture seems meager. Possibly this is because farming was largely done by slaves and *coloni*. Owners of great estates are twice mentioned, and farmers are well spoken of as "cultivators of the fields who seek their fortunes with their own strength, efficient, prudent, and who always joy and delight in damp soil"; and again as "respectable farmers of decent habits, and rich, and whose possessions always adjoin the sea or rivers or swamps."<sup>1</sup> Gardeners, on the other hand, are once called "wretched."

From honest employment we pass to the underworld of crime and vice. It does not, however, seem to have been kept under very successfully in Firmicus' day. His descriptions of the ways in which men meet with injuries and death<sup>2</sup> give the impression that he lives in an age of war and violence. Sixty-eight passages predicting accusations, judicial sentences, and forms of punishment also give a sinister impression of his age, whether we choose to take them as signs of a disorderly and criminal society, or as manifestations of a suspicious, cruel, and oppressive government. A dozen passages show the prevalency of capital punishment, and seven others mention executioners. Seven attest the widespread employment of torture in this period, and twenty-two prophesy imprisonment, or mention wardens and prison guards. The squalor of prisons and the unkempt hair and deformity of prisoners are described. Men are sometimes imprisoned for life, or at least die in prison. Twelve passages mention delation, informers, and betrayers. Firmicus seems to regard them and executioners as of the same class with criminals. The following are the varieties of crimes and criminals in the order of the frequency with which they are mentioned in some 36 passages: thieves and unspecified homicide, 7 times each; sorcerers, 6; temple robbers, and death at the hands of pirates or brigands, 5; family murders, burglars, forgers, and those who deny

<sup>1</sup> *Ibid.*, 102, 22, and 254, 22.

<sup>2</sup> Of 135 passages directly mentioning death (and not including such predictions as, "They lose wives and children," or "murderers of wife and children") 53 use the word *biothanati* to indicate a violent death; 10 use *violentus*; an "evil death," 17; from disease, 11; from insanity, 1; from vicious excesses, 1; by falls from heights, 5; by sword, 5; by water, 4; by fire, 3; by ruins, 1; thrown to beasts, 1; in battle, 1; as a gladiator, 1; by robbers, 2; by pirates, 2; by one's domestics, 1; abroad, 5; in the desert, 1; in watery regions, 1; in prison, 2; public, 4; as a judicial penalty, 6 or 8; early death, 8; sudden and painless, 2; sad, 2; glorious, 1.

deposits intrusted to them, 4; poisoners, and further mentions of brigands and of pirates, 3; vagabonds, 2; cutthroats, and suicide, once each. Poisoners are twice mentioned with sorcery, and secret writings are so mentioned once.

Firmicus gives a shocking and disgusting picture of the immorality of his age, and devotes as much space to lust and vice as to religion. Of sixty-four passages nine mention courtesans and harlots; four speak of panderers; incest and cohabitation with relatives are described in seven places, and four times at considerable length; adultery is mentioned four times; eight passages predict pederasty, the great vice of antiquity; effeminates are mentioned twice; unnatural vices and lusts of men, three times; those of women, also three times. The remaining passages speak either of illicit love and sexual intercourse, or of an impure life, or in a general way of vices and lusts, sometimes described as "preposterous." In nineteen cases vice and lust involve the offender in infamy, which also is predicted in fifteen passages where no specific mention of sexual immorality occurs. Sexual deficiency is often correlated with immorality. It is interesting to observe that in the *De errore* Firmicus criticizes the immoral ritual of pagan cults in the same phrases that he employs in predicting vice in the *Mathesis*.

Nor do Firmicus' predictions give us a favorable impression of family life in the fourth century. Homes seem to be disrupted too frequently, and the members of families are too often separated by death or dissension.<sup>1</sup> Marriage does not appear to be in a normal and healthy state.<sup>2</sup> Finally the evidence is strong for the prevalence

<sup>1</sup> Death of both parents or orphanage of children (*orbus, orbilas*), 18 (in some cases, however, the meaning seems to be that children are deprived of their parents' society and care rather than bereaved); death of father, 6; death of mother, 5; sickness of mother, 5; her enslavement, 1; separation from parents, 3; alienation from them, 5.

<sup>2</sup> Remain unmarried, 4; marry late, 4; "marry with difficulty," 4; (5 of these cases of remaining unmarried or marrying with difficulty are due to sterility); an early marriage, only once; many wives, 1; a "good marriage," 3; men gain wealth, happiness, and success through their wives, 10; a wife from a temple, 1; marriage with a prophetess, 1; a foreign wife, 1; 12 undesirable marriages, including one "unworthy" marriage, one unhappy match, one case where the husband "contracts infamy from his wife's conduct," six cases where men wed prostitutes, while wives are described twice as sterile, once as feeble, once as deformed, once as old, once as a virago, twice as not compliant to their husbands, thrice as slaves, once as degenerate, once as of lower birth than the husband, and thrice as widows, who seem almost as unfavorably

of much sterility and childlessness, yet the old practice of exposing infants seems to continue unabated.<sup>1</sup> All this goes to prove the depopulation and decline of the empire. Nine passages show that the principle of primogeniture is observed in transmitting family property and suggest a selfish spirit on the part of the younger brothers, who would seem to be hoping for the death of their older brothers.<sup>2</sup> In comparing eighteen mentions of family dissensions with seventeen indications of family affection it should be remembered that the latter is probably usually taken for granted. It is, in fact, generally mentioned incidentally, not predicted expressly. One pleasing picture is of "fathers of families, removed from all luxurious pleasure, just, having leisure for self-communion, apart from the uproar of public intercourse."<sup>3</sup>

From Firmicus' descriptions of human personalities we can perhaps gain some further notion of the men and moral standards of his time. His character-sketching seems frank, unprejudiced, and true to life; he occasionally mingles good and evil traits in the same persons. Among desirable characteristics three stand out, namely, goodness, charm, and intellectual ability.<sup>4</sup> Men possessed of personal charm succeed in life much oftener than those who are merely good, and slightly oftener than men with brains. They also get along with their wives better than good men do. The good, however, are often attractive too, as in one case of justice, piety, firm regarded as the others. Unstable affection of husband toward wife or quarrels between them occupy 8 passages, in 3 of which the children too are concerned. Yet in 3 of these same cases the men are given high characters. In other passages actual divorce is mentioned but once; separation, however, occurs 4 times; widowhood, 7; death of wife, 4.

<sup>1</sup> No children, 12; "either one child or none," 1; "hardly have children," 1; extinction of an entire family, 1; a large family, 2; children of both sexes or twins, 1; death of one's children, 4; loss of their affection, not including cases already listed, 2; adoption, 5; viragoes, 2; hermaphrodites, 4; eunuchs, 4; *archigalli*, 3; exposed, 13.

<sup>2</sup> Such passages as, "He will be older than all his brothers, or if anyone was born before him, such a one will be alienated from his parents." Kroll-Skutsch, 97, 17; 97, 21; 105, 20; 105, 28; 127, 16; 131, 8; 131, 12; 187, 5; 247, 17.

<sup>3</sup> Kroll-Skutsch, 253, 18.

<sup>4</sup> *Boni, justi, honesti, honestis moribus*, etc., 30; in 8 charming also and twice lovers of pleasure, in 4 serious and grave, in 3 successful, once easily deceived, once critical. *Venusti, grati, suaves, decori, decentes, amabiles*, 22; of whom 3 are lustful, 9 successful. *Ingeniosi, cordati, arguti, acuti, magnae mentis*, 19; of whom 1 is good, 1 modest, 2 efficient, 6 successful.

We may also note men who are great, 2; or "divine," at least in certain respects, 5.

love of friends, and a pure and noble life, combined in men who are not only "delightful, gay, musical, continually at play, lovable, pleasing, charming . . . tall and blonde, their eyes flashing with a bright fascination," and with beautiful hair, but who are also "lustful lovers . . . often ardently inclined to sexual intercourse." To complete this description of the attractive sons of the planet Venus, we must add that they are large drinkers, moderate eaters, blest with excellent digestion, and that their "life, spirit, and profession ever adheres to music's delights."<sup>1</sup> Efficiency, prudence, bravery, seriousness, temperance, truthfulness, reliability, fidelity, stability, humanity, sociability, and simplicity are other desirable qualities bestowed by the stars. With such traits as ambition, imperiousness, being puffed up with lofty pride, luxury, show, and profusion we near the boundary of undesirable characteristics; but these are stated as attributes of good as well as of evil men. The repellant traits most frequently named are badness and slowness,<sup>2</sup> which are to some extent correlated with inefficiency and stupidity. We also hear of violence and passion, falsehood, fickleness, cruelty, avarice, miserliness, covetousness, jealousy, enmity, treachery, ingratitude, bitterness, and lugubriousness.

Besides predictions concerned with specific occupations and phases of life, much of Firmicus' space is taken up by vaguer prophecy of prosperity or adversity. It is here that he is most rhetorical. At first sight it may seem that such passages, even taken in the conglomerate, are unlikely to yield any historic facts. Yet one may get from them some idea of the goods most highly prized, if not actually most frequently attained, by the men of that age, and some knowledge of the miseries which they dreaded most or which were in fact their lot.

Forecasts of well-being may be grouped for the most part under three heads: happiness, wealth, and the kindred matters of power, honor, and fame. To this last group 120 passages apply.<sup>3</sup> To wealth 125 refer, but many of these do not imply that the persons concerned

<sup>1</sup> Kroll-Skutsch, 249, 19.

<sup>2</sup> *Malus, malignus, malitiosus, malivolus, iniustus*, 21; *tardus, piger*, 11.

<sup>3</sup> Distributed as follows: power, 44; glory, 41; nobility, 30; honor, 23; dignities, 17; greatness, 15; *clarus*, 9; *famosus*, 5; *notus*, 5; *principatus*, 5; authority, 3; splendor, 3.



are to be very rich. In many cases men grow rich through the regular pursuit of callings already listed; there are also eight general descriptions of self-made men. Inheritance, however, is a great source of wealth, or at least is one eagerly anticipated by those consulting astrologers.<sup>1</sup> If, however, we think that seven passages which hold out hopes of finding hidden treasure are visionary, we are mistaken, since there are three laws on the discovery of hidden treasure in the Theodosian Code.<sup>2</sup> Women seem often to be property-holders.

The treatment of the theme, happiness, is most extraordinary. With a very few exceptions Firmicus has but one word to denote happiness, *felix* or *felicitas*, which occurs in 101 passages. When other words modify and qualify it, they are merely quantitative or quite colorless. We hear often enough of "the greatest felicity," and of "increase of felicity," of "the trappings of felicity," and "the adornments of felicity," while a few times "superfluous felicity," and "happiness beyond measure" are mentioned. But qualitative and descriptive modifiers are lacking. In his descriptions of human personalities and of family life Firmicus gave us a few glimpses of a really happy existence, but in passages dealing primarily with prosperity and well-being he seems able to define happiness only in terms of wealth, position, and power. Thus felicity seems to consist largely of the possession of externals and one rather gets the impression that fourth-century humanity was not happy after all, or at least that Firmicus himself derives little satisfaction from the prospect. In predicting wealth, fame, and power his vocabulary is only a little less restricted and stereotyped than in his monotonous reiteration of promises of felicity. He expresses himself without gusto in formulae which possess little vividness or concreteness. His few allusions to amusements point in the same direction. This attitude may express the spirit of an age of decline; it may be partly due to a certain incapacity for gaiety inherent in Roman character; it may be to some extent the product of Firmicus' own temperament and outlook on the world. From this hard world where Socrates and Plato suffered while Alcibiades and Sulla prospered, from his

<sup>1</sup> Twenty-one passages.

<sup>2</sup> Book X, Title 18, Laws of 315, 380, and 390 A.D.

own perilous and thankless post as defender of the wretched and oppressed against the avaricious and the wicked in the sordid sphere of law courts and forum, he tells us that he has gladly retired to spend his leisure with the divine men of old of Egypt and Babylon and to purify his spirit by contemplation of the stars and of the supreme God who works through them.

It is with a richer vocabulary, a more vivid style, and apparently a deeper sympathy that our author paints the life of the unfortunate and writes "the short and simple annals of the poor." This becomes the more impressive when we remember that he is a man of senatorial rank and writes for an official high in the imperial service. The condensed formulae of an astrological handbook may seem the last place where one would look for *lacrimae rerum*, but Firmicus often alludes to the weary and heavy laden of the ancient world. Professor Dill has noted the same tone in the language of the legislation of the declining empire in the next century. He speaks of its "minute and circumstantial description of oppression and wrong," and again says, "Many of these edicts betray the style of the school rhetorician, and yet there is in many of them the ring of genuine sympathy for misery."<sup>1</sup>

The predictions of adversity do not fall as naturally into three great groups as did the promises of prosperity, but I will try to maintain somewhat the same division for purposes of comparison. The 120 predictions of power, nobility, and fame may be offset by 132 passages containing allusions to slavery, captivity, toil and hardship, a low and ignoble existence, unpopularity and infamy.<sup>2</sup> Against the 125 allusions to wealth may be set 50 predictions of loss of property and 40 descriptions of poverty and destitution. Corresponding to the 101 cases of felicity are 104 passages in which a greater variety of terms is used to denote adversity and unhappiness in general. In fine, whereas generals were mentioned more often than soldiers, and kings than day laborers, the unfortunate are described as often as the prosperous. Moreover, there are fewer duplicates than before. Wealth and happiness went together 33 times, misfortune and

<sup>1</sup> *Roman Society in the Last Century*, 230-31.

<sup>2</sup> Slavery and servitude, 39; captivity, 13; degenerates, 3; ignoble, 10; inglorious, 2; abject, 2; subjected, 4; dejected, 5; a life of toil, 34; *invidia*, 6; infamy, 34.

poverty are mentioned in the same passage only 22 times; happiness went with power, honor, and fame 32 times, misfortune goes with their opposites only 22 times; wealth was associated with power, honor, and fame 33 times, poverty is mentioned with their opposites only 10 times. That Firmicus saw other factors in unhappiness is further manifested by the fact that he associates it 9 times with danger, 17 times with disease, 9 times with death, 6 times with imprisonment and other penal afflictions. Danger he mentions 51 times in all. Finally against 17 predictions of success that have not yet been recorded may be set 27 failures.<sup>1</sup>

Death, injury, and disease loom up large in Firmicus' prospectus for the human race, making us realize the benefits of nineteenth-century medicine as well as of modern peace. No less than 174 passages deal with disease and many of them list two or more ills. Mental disorders are mentioned in 37 places;<sup>2</sup> physical deformities in six. Other specific ailments mentioned are as follows: blindness and eye troubles, 10; deafness and ear troubles, 5; impediments of speech, 4; baldness, 1; foul odors, 1; dyspeptics, 4; other stomach complaints, 7; dysentery, 2; liver trouble, 1; jaundice, 1; dropsy, 5; spleen disorders, 1; gonorrhoea, 2; other diseases of the urinary bladder and private parts, 6; consumption and lung troubles, 6; hemorrhages, 6; apoplexy, 3; spasms, 5; ills attributed to bad or excessive humors, 12; leprosy and other skin diseases, 6; ague, 1; fever, 1; pains in various parts of the body, 6; internal pains and hidden diseases, 9; diseases of women, 5. There remain a large number of vague allusions to ill-health: 21 to debility, 12 to languor, 3 to invalids, and 49 other passages. Only eight passages allude to the cure of disease. Among the methods suggested are cauterizing, incantations, ordinary remedies, and seeking divine aid, which last is mentioned most often. The eleven references to medical practitioners should, however, be recalled here. The predictions as

<sup>1</sup> Under success I class description of persons "who get whatever they desire," or "who gain all things easily," or "who are always accustomed to do well"; failures are those who "are impeded in all their acts," or who are easily deceived, cheated, and gotten the better of, whether by man or by fate.

<sup>2</sup> *Aestus animi*, 5; insanity, 13; lunatics, 10; epileptics, 8; melancholia, 3; inflammation of the brain (*frenetici*), 4; delirium, dementia, demoniacs, alienation, and madness, one or two each; vague allusions to mental ills and injuries, 5.

to length of life are inadequate to the drawing of conclusions on that point.

Such is the census of the human race given in the third and fourth books of the *Mathesis* of Julius Firmicus Maternus. Taken altogether, the description seems to fit the age and to give us a fairly clear photograph, even if it is taken by the flashlight of astrology, of ancient civilization in one of its last phases.

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## ROGER BACON AND EXPERIMENTAL METHOD IN THE MIDDLE AGES.

THE year 1914 marks approximately the seventh centennial of the birth of Roger Bacon, and offers opportunity for a reconsideration of his place in thirteenth century thought and of his relation to modern science. Two hundred years ago, before Jebb had edited the *Opus Maius* in 1733, Roger Bacon was unappreciated and unknown. Today many will incline to celebrate his anniversary as that of the first rebel against mediæval scholasticism and the first prophet of modern science. They may feel that such recognition is the more due to his memory because they believe him to have been a prophet without honor and persecuted in his own age, or because they believe that in later times Francis Bacon received the praise that was Roger's due. They will set Roger's four causes of human error against Francis's idols; they will point to Roger's urging the study of Greek, Arabic, and Hebrew as well as Latin, and to his sharp criticism of the translations of Aristotle in vogue in his day, to his investigations in optics, to his insistence upon the importance of the mathematical method, whose value Francis scarcely realized; but above all they will remember Roger's criticism of scholastic methods, of reliance on authority, and his advocacy of experimental method. It is of this last point, long regarded as the brightest gem in Roger's crown, that the present article will treat, inquiring what Bacon's discussion of 'experimental science' really amounts to, whether his conception was a novel one or the common property of his age, and finally what the actual status of experimentation was at that time.

But before attacking this particular problem it will be well to give some idea of recent study of Bacon and the progress of opinion concerning him, especially since doing this will pave the way for our argument. Much attention has been given to Bacon since the editing in 1859 by Brewer of a number of his writings

hitherto unpublished,<sup>1</sup> and the almost simultaneous appearance in 1861 of Émile Charles's *Roger Bacon; sa vie, ses ouvrages, ses doctrines*. Unfortunately Charles wrote without knowledge of Brewer's labors, and it must be added that several writers on Bacon since have failed to keep abreast with the latest research in their field. These works by Brewer and Charles educed a number of minor essays and studies in the following decades.<sup>2</sup> Then a new impetus to the study of Bacon was given in 1897 when the *Opus Maius*, previously accessible only in Jebb's rare and incomplete edition, was re-edited by Bridges.<sup>3</sup> In the same year Father Gasquet published a new fragment which he regarded as an introduction to the *Opus Maius*.<sup>4</sup> In 1902 Nolan and Hirsch edited Bacon's Greek Grammar. Then in 1909 Professor Duhem gave to the world a newly discovered fragment of the *Opus Tertium*: in 1911 the British Society of Franciscan Studies printed the *Compendium Studii Theologiae*, and, in 1912, more of the *Opus Tertium*.<sup>5</sup> Meanwhile Robert Steele, who in 1905 had edited a fragment of Bacon's Metaphysics, since 1912 has been producing the *Communia Naturalium*.

As Bacon's works have thus become more generally known and as standards of historical criticism have grown more strict, his life, doctrines, and point of view or personal equation have been more carefully examined and analyzed, and much legend and exaggeration have been exposed, although still repeated in some quarters. Indeed, the very writer who rejects some one legend may hold fast to the old view of Bacon in all other respects.

<sup>1</sup> Fr. Rogeri Bacon *Opera quaedam hactenus inedita*. Ed. J. S. Brewer, London, 1859; Vol. 15 of *Rerum Britannicarum mediæ ævi scriptores*, (published under the direction of the Master of the Rolls and usually spoken of as "The Rolls Series"). This work will hereafter be cited as *Brewer*.

<sup>2</sup> For bibliography of these and later works on Bacon see the article on Roger Bacon in the *Catholic Encyclopedia*, and "The Seventh Centenary of Roger Bacon (1214-1914)," by Fr. Paschal Robinson in *The Catholic University Bulletin*, Vol. xx, pp. 3-9 (Jan., 1914).

<sup>3</sup> The *Opus Maius* of Roger Bacon. Ed. J. H. Bridges, Vols. I and II, Oxford, 1897; Vol. III (correcting numerous errors in I and II), 1900. This work will be hereafter cited as *Bridges*.

<sup>4</sup> *English Historical Review*, XII, 494-517. This will be cited as *Gasquet*.

<sup>5</sup> *Part of the Opus tertium of Roger Bacon*. Ed. A. G. Little, Aberdeen, 1912. This will be cited as *Little*. It includes Duhem's fragment.

There is, therefore, the more reason for a brief collective review of this criticism which hitherto has been somewhat piecemeal and fragmentary.

For one thing, it is admitted by many that Bacon did not anticipate modern inventions by actual discoveries. As far back as 1864 *The Westminster Review* said: "It can easily be shown that of the things which Bacon is asserted to have invented, several were perfectly well known before his time, and the rest are nowhere described in his works."<sup>6</sup> He mentions spectacles and explosives but does not claim them as his own discoveries; he dreamed of future marvels of science but he worked none of them out in detail. Perhaps he thought that he could, but then, he thought that he could make gold artificially.

Secondly, Bacon cannot be proved a martyr to science, nor have we any evidence that his contemporaries hated him and that the church persecuted him for his scientific studies. On the contrary, his best works were produced at the command of the pope,<sup>7</sup> and one of their chief aims is to induce the church to enlist science in its service and to profit by scientific discoveries. Abbé Feret has shown how through the nineteenth century successive historians, including even Charles, kept adding to the story of Bacon's persecution by the Franciscans, without giving any references to the sources for details which they elaborated from their imaginations.<sup>8</sup> The legend that he was imprisoned from 1257 to 1267 rests simply on unwarranted inference from his own statements to the pope,<sup>9</sup>—statements which really only show that in recent years he has not won the fame which he thinks his due, that he is jealous of his more successful contemporaries, and that he is desperately anxious to secure the

<sup>6</sup> Vol. 81, p. 247, in an article on "The Philosophy of Roger Bacon." At page 1 of the same volume begins an article on "The Life and Writings of Roger Bacon."

<sup>7</sup> For the pope's letter see *Brewer*, p. 1.

<sup>8</sup> P. Feret, "Les emprisonnements de Roger Bacon," *Revue des questions historiques*, Vol. 50, pp. 119-142. See also the *Catholic Encyclopedia*; whereas the last edition of the *Britannica* preserves the old legends. For a *reductio ad absurdum* of the legend-building note, A. Parrot, *Roger Bacon et ses contemporains*, Paris, 1894. Parrot also is ignorant of *Brewer's* edition and regrets that the *Opus tertium* is still unprinted (p. 51).

<sup>9</sup> Contained mainly in the first twenty chapters of the *Opus tertium*.



pope as his patron. However, an Assisi manuscript of the early fourteenth century states that in 1277, a decade after his writings to the pope, a council of his Order condemned "the doctrine of Rogerius Bacho, an English master of sacred theology, since it contained some suspected novelties, on account of which the said Roger was condemned to prison."<sup>10</sup> But what the novelties were we are not informed; they were probably theological rather than scientific. Some writers have assumed that they were astrological, but there was nothing 'novel' about Bacon's astrology.<sup>11</sup> Theories that Bacon was accused of magic are also unwarrantable inferences from his own statements. He complains that the Canon Law confuses mathematics and magic, and that philosophers are sometimes falsely accused of magic; it is thereupon assumed that what he says may happen to others did happen to himself.

In the third place, Bacon's outspoken criticism of the learning of his age is no longer unquestioningly accepted. A review in the *English Historical Review* for October 1912, "hopes that it is not an article of faith with the Society of Franciscan Studies to accept all of Roger Bacon's statements. As regards the state of knowledge among his contemporaries, his assertions are often of no greater value than the similar assertions of his distinguished namesake in a later age."<sup>12</sup> It is seen that his tendency to indulge in personalities and to belittle his distinguished contemporaries must be discounted. When he sneers at meritorious scholars like Albertus Magnus and William of Meerbeke,<sup>13</sup> one wonders how far to accept his hostile estimate of the schools at Paris, his boasts of his own superior knowledge and better methods of teaching, his professed exploitation of neglected fields in linguistics, mathematics, optics, alchemy, and experi-

<sup>10</sup> Bridges, III, 158.

<sup>11</sup> P. Mandonnet, "Roger Bacon et le 'Speculum astronomiæ,'" *Revue Néo-Scholastique*, Vol. 17 (Aug., 1910), tries to prove that Bacon and not Albertus Magnus wrote the *Speculum*, that it was written in 1277, and that he was condemned on account of it; but I see many reasons (which I hope to set forth in print soon) for hesitating to accept his conclusions. Mandonnet's method of historical inference in another connection has been satirized by Ch. v. Langlois in the *Revue de Paris* for Sept. 1, 1900.

<sup>12</sup> "W. H. V. R." on p. 810.

<sup>13</sup> *Opus tertium*, Cap. 2, and *Compendium studii*, Cap. 8 (*Brewer*, p. 14 and 472).

mental science. His censure of the translations of Aristotle in use at Paris loses much of its force, when we learn that he himself bases some of his views upon mistranslated passages from Aristotle,—passages which Albert and Aquinas translate as well or better than he.<sup>14</sup> Also we must remember that Bacon is addressing the pope and trying to interest him not only in the reform and advancement of learning but in Roger Bacon. So if, as Macaulay said, Francis Bacon seeking the truth was a very different person from Francis Bacon seeking the seals, we must remember that Roger combines both attempts at once.

Fourthly, the faults of Bacon's own learning, his superstition and credulity, his belief in alchemy and astrology, have been noticed, so that a recent reviewer speaks of "the usual Baconian atmosphere, in which science and superstition are happily or unhappily compounded."<sup>15</sup> These weaknesses are usually charged in large measure and correctly to the age in which Bacon lived; but, while some treat them as only throwing his merits into higher relief, these failings at least support Hastings Rashdall's assertion that "Bacon was more the child of his age than he imagined himself to be,"<sup>16</sup> and perhaps may be taken as an indication that his virtues, too, were those of his age.

Father Mandonnet, the erudite author of *Siger de Brabant et l'averroïsme latin au XIIIe siècle*, thinks that Bacon's importance has in many ways been over-estimated.<sup>17</sup> While Charles held that, if Bacon's scientific importance had been exaggerated, his value as a schoolman had been lost sight of, Mandonnet affirms that as a philosopher and theologian, Bacon was behind rather than in the forefront of his age. Bacon has been reproached for making philosophy and science ancillary to theology,<sup>18</sup> but he

<sup>14</sup> K. Werner, "Die Kosmologie und allgemeine Naturlehre des Roger Baco," *Sitzungsberichte d. ph.-hist. cl. etc.*, Wien, 1879, Band 94, p. 495.

<sup>15</sup> "W. H. V. R." in *English Historical Review*, Vol. 28, p. 805 (Oct., 1913).

<sup>16</sup> *Fratri Rogeri Bacon Compendium Studii Theologiae*. Ed. H. Rashdall, Aberdeen, 1911, p. 3.

<sup>17</sup> Mandonnet, *Siger de Brabant*, Deuxième édition, 1908-1910, Vol. I, pp. 40, 244-8.

<sup>18</sup> See Gasquet, 509. Nam sum certus quod solum illud de philosophia est utile et dignum quod sapientia sacra dignatur, sicut ab ancilla, requirere; totum enim residuum stultum est et insanum. See also H. O. Taylor, *The Mediæval Mind*, II, 486.

could scarcely do otherwise when addressing the pope and trying to induce the church to support science.

This changing tide of opinion concerning Bacon's life and works both suggests that there may be room for further revision of our estimate of him, and provides a more correct setting for his discussion of experimental science. But to evaluate this properly we must rid ourselves of one more false assumption, namely, that mediæval learning was exclusively scholastic and theological, and that Bacon in his advocacy of natural science was "a voice crying in the wilderness." This notion still survives in writers whose estimate of Bacon is otherwise sane and critical. Thus the articles in *The Westminster Review*, quoted above against the attribution of modern inventions to Bacon, and which further state that the merit of the *Opus Maius* "lies rather in the spirit in which it was written than in the facts it records or in any merit which it may have as a scientific whole," go on to say that "Bacon preached a philosophy of which not half-a-dozen men in Europe saw the value, and of which the majority of really good men feared the results," and that "when Roger Bacon was laid in his grave the real philosophy was buried with him."<sup>19</sup> Such is still the impression given by otherwise excellent recent estimates of Bacon, such as those in the *Catholic Encyclopedia* and in Henry Osborn Taylor's *The Mediæval Mind*.<sup>20</sup>

But such an assumption is ungrounded. Most educated persons are, it is to be hoped, by this time aware that the middle ages were not 'dark ages,' that the classical revival of the 15th and 16th centuries was no new birth of civilization, and that our modern states, literatures, laws, cities, and universities had begun by the twelfth century. It should equally be realized that the rise of modern science can no more be associated with

<sup>19</sup> *Westminster Review*, Vol. 81, pp. 12, 9, and 252.

<sup>20</sup> Taylor's discussion of Bacon occurs in Vol. II, pp. 483-508. He goes farther than the sources justify in some of his assertions concerning Bacon's life, though he is caution itself compared to some writers.' For instance, it cannot be shown that before 1266 Roger's pursuit of learning "had been obstructed by the Order of which he was an unhappy and rebellious member"; nor that "he had evidently been forbidden to write, or spread his ideas; he had been disciplined at times with a diet of bread and water."

the so-called Renaissance than with the so-called Middle Ages. The scientific interests and the characteristics of works on nature in those two periods were very similar. Of course there was progress, but there was no break, they merge into each other. Galileo's telescope was the natural outgrowth of earlier investigations concerning lenses which had resulted in the use of spectacles as early as the thirteenth century. Printers of the 15th and 16th centuries found plenty of readers for the many mediæval works on nature which they published and which often ran through several editions. The narrow humanist had no more interest in natural science than the narrow schoolman. In the middle ages logic and discussion were not the only forms of intellectual exercise, though they largely displaced the rhetoric and oratory of Roman days. The collection of facts was another engrossing pursuit, as the voluminous mediæval encyclopedias testify; there was keen curiosity about the things of this world. Open a book for general reading in a vernacular language, the long French poem, *The Romance of the Rose*, and you will find there more allusions to natural science and to human history than to logic and theology. Perhaps in the early middle ages literature was almost exclusively ecclesiastical and based upon patristic authorities. But through the twelfth century the tide of secular and scientific learning was rising, until in the first part of the next century the University of Paris was powerless to prevent the study of the newly discovered books of Aristotle in natural philosophy. Aristotle, moreover, was far from being the sum and substance of mediæval science which drew from many other sources, such as Ptolemy, Pliny, Galen, and the Arabs, and which made original contributions and practical discoveries of its own. It was an age when even a superstitious book on magic and necromancy such as *Picatrix* declared that science was God's greatest gift to man, since "It always is making acquisitions and never diminishes; it ever elevates and never degenerates; it is always clear and never conceals itself."<sup>21</sup> And

<sup>21</sup> Lib. I, Cap. I, of *Picatrix* as contained in Ms. XX, 20, National Library, Florence. Semper acquirit et numquam diminuit; semper elevat et numquam degenerat; semper apparet et numquam se abscondit. *Picatrix* was translated from Arabic into Spanish by order of Alfonso X. (1252-1284), and eventually was translated into Latin. There are two Mss. of it at Florence.

even Bacon asserts that many scientific facts and truths were now known of which Plato and Aristotle, Hippocrates and Galen had been ignorant.<sup>22</sup>

It would be exceeding the limits of this article to discuss further this mediæval interest in natural science, and there are already a number of books or papers dealing with that field, although undoubtedly a great deal remains to be done. Even the subject of experimentation in the middle ages has been approached, but never sufficiently discussed. Pouchet in his *Histoire des sciences naturelles au moyen âge, ou Albert le Grand et son époque considérés comme point de départ de l'école expérimentale*<sup>23</sup> was one of the first to point out Albertus Magnus's insistence on the necessity of experience as a criterion of truth in natural science, but his discussion goes little farther than that. Abbé Narbey's "Le moine Roger Bacon et le mouvement scientifique au XIIIe siècle"<sup>24</sup> is another promising title which leads to disappointment. Mr. Taylor gives a discriminating analysis and estimate of Bacon's discussion of experimental science, considered *per se*, but regards it as a unique contribution, calling it "this most original and 'advanced' product of Bacon's genius."<sup>24 a</sup>

It has, however, been observed that there was much practical experimenting in Bacon's time among artisans and alchemists. Picavet writes on this point, "It is well known that the technical arts attained great perfection. What is less realized is that the thirteenth century marks an important epoch in the history of the experimental sciences, that Roger Bacon is not an isolated apparition or exception. There was a whole school of alchemists who performed the experiments mentioned by ancient writers and devised new ones."<sup>25</sup> But this article will not compare what Bacon said with what others did but only with what others said;

<sup>22</sup> Brewer, p. 542; *De secretis operibus artis et naturæ et de nullitate magiæ*, Cap. 7.

<sup>23</sup> Paris, 1853.

<sup>24</sup> *Revue des questions historiques*, Vol. 35 (1884), pp. 115-166. Narbey is still another Frenchman who shows no acquaintance with Brewer's edition.

<sup>24 a</sup> H. O. Taylor, *The Mediæval Mind*, II, 500.

<sup>25</sup> F. Picavet, *Esquisse d'une histoire générale et comparée des philosophies médiévales*, Paris, 1905, p. 224. See, too, P. E. M. Berthelot, *La chimie au moyen âge*, 1893, 3 vols.

it will confine its attention to allusions to experimental method in the writings of Bacon and his contemporaries. Many of the latter are today comparatively inaccessible and unknown, since they exist only in rare old printed editions; and the admirers of Bacon who reproach previous centuries with their neglect of Roger's works are unconscious that they are similarly neglecting a considerable group of mediæval men of science.

We have first to examine Bacon's discussion of "experimental science" (*scientia experimentalis*), to which one section of his *Opus Maius* is devoted<sup>26</sup> and to which he adverts more briefly in other works. He regards it as the best criterion of truth in natural science. "All sciences except this either merely employ arguments to prove their conclusions, like the purely speculative sciences, or have universal and imperfect experiences;"<sup>27</sup> while "It alone, in truth, has the means of finding out to perfection what can be done by nature, what by the industry of art, what by fraud"; for it alone can distinguish what is true from what is false in "incantations, conjurations, invocations, deprecations, and sacrifices."<sup>28</sup>

But how is one to set about experimenting? On this point Bacon is disappointing. His explanation of the rainbow, which is his longest illustration of the value of experimental science, is based merely on ordinary intelligent observation and reasoning, although he adds at the close that tests with instruments are needed and that consequently he will not assert that he has reached the full truth of the matter.<sup>29</sup> Elsewhere he speaks of astronomical experiments "by instruments made for this purpose," but seems to regard the unaided eyesight as sufficient for the investigation of terrestrial phenomena. Bacon has sent "over sea and to various other lands and to annual fairs, in

<sup>26</sup> *Bridges*, II, 167-222; *Little*, 43-54.

<sup>27</sup> *Gasquet*, 510. . . . scientie omnes preter hanc vel utuntur argumentis tantum ad probationem conclusionum suarum, ut pure speculative scientie, vel habent experientias universales et imperfectas.

<sup>28</sup> *Bridges*, II, 172. Hæc ergo sola novit perfecte experiri quid potest fieri per naturam, quid per artis industriam, quid per fraudem, quid volunt et somniant carmina conjurationes invocationes deprecationes sacrificia. . . .

<sup>29</sup> *Ibid.*, II, 201.

order that I might see the things of nature with my own eyes.”<sup>30</sup> “And those things which are not present in our locality we may know through other sages who have experienced them, just as Aristotle by authority of Alexander sent two thousand men to different regions to experience all things on the face of the earth, as Pliny testifies in his Natural History.”<sup>31</sup> The one contemporary who most nearly fulfills Bacon’s ideal of what an experimental scientist should be, does not spend his time merely in reading, attending lectures, and engaging in disputations, but “is ashamed to have some layman or old-wife or knight or rustic know facts of which he is ignorant”; hence he goes out into the world and observes the doings of common workingmen and even takes hints from the operations of witches, enchanters, and magicians.<sup>32</sup> Bacon even believes that valuable medicines can be discovered by observing what remedies various animals employ. It would seem that experimental method is in a low stage of its development, if it takes lessons from common human experience and from the actions of brutes. Bacon sufficiently indicates, however, that it does not consist merely of observation and casual experience, but includes purposive experimentation, and he often speaks of “experimenters.” Undoubtedly he himself experimented. But the fact remains that he gives no directions concerning either the proper environment for experimenting or the proper conduct of experiments. Of laboratory equipment, of scientific instruments, of exact measurements, he has no more notion apparently than his contemporaries.

Bacon says far more of the marvelous results which he expects experimental science to achieve than he does of method. Some of his dreams have been brought true by modern mechanical inventions, but in the main marvelousness rather than practic-

<sup>30</sup> *Gasquet*, 502. Unde multotiens ego misi ultra mare et ad diversas alias regiones et ad nundinas sollemnes ut ipsas res naturales oculis viderem et probarem veritatem creature per visum. . . .

<sup>31</sup> *Bridges*, II, 169. Et quæ non sunt præsentia in locis in quibus sumus, scimus per alios sapientes qui experti sunt. Sicut Aristoteles auctoritate Alexandri misit duo millia hominum per diversa loca mundi ut experirentur omnia quæ sunt in superficie terræ, sicut Plinius testatur in Naturalibus.

<sup>32</sup> *Brewer*, 46-47. Immo verecundatur si aliquis laïcus, vel vetula, vel miles, vel rusticus de rure sciat quæ ipse ignorat.

ability characterizes the aims which he proposes for *scientia experimentalis*. Indeed, of the three ways in which he represents it as superior to all other sciences, while one is that it employs sure proofs rather than mere arguments, two are that by it life may be greatly lengthened, and that from it a better knowledge of the future may be gained than even from astrology.<sup>33</sup> Thus experimental method is especially connected with alchemy and astrology. Bacon declares that "it has been proved by certain experiments" that life can be greatly prolonged "by secret experiences,"<sup>34</sup> and he believes that Artephius was enabled by such methods to live for a thousand and twenty five years.<sup>35</sup>

Some of his 'experiments' are as fantastic as the aims are marvelous. "A good experimenter says in the book *De regimine senum*" that the following elixir will greatly prolong life: "that which is temperate in the fourth degree, and what swims in the sea, and what grows in the air, and what is cast up by the sea, and plant of India, and what is found in the entrails of an animal of long life, and those two serpents which are the food of the inhabitants of Tyre and Aethiopia."<sup>36</sup> We also are told that "at Paris recently there was a sage who asked for snakes and was given one and cut it into small sections except that the skin of its belly on which it crawled remained intact; and that snake crawled as best it could to a certain herb by touching which it was instantly made whole. And the experimenter collected a herb of wonderful virtue."<sup>37</sup>

Credulity, in contrast to the skeptical attitude of modern

<sup>33</sup> *Gasquet*, 510; and *Bridges*, *passim*.

<sup>34</sup> *Bridges*, II, 205. Præterea certis experimentis probatum est, quod ista festinatio nimia est retardata pluries, et longævitas prolongata per multos annos per experientias secretas.

<sup>35</sup> *Ibid.*, 212.

<sup>36</sup> *Ibid.*, 210. Et ideo dicit experimentator bonus in libro de Regimine Senum, quod si illud quod est in quarto gradu temperatum, et quod natat in mari, et quod vegetatur in ære, et quod a mari projicitur, et planta Indiæ, et quod est in visceribus animalis longæ vitæ, et duo serpentes quæ sunt esca Tyrorum et Æthiopum, . . . .

<sup>37</sup> *Ibid.*, 208. Nam Parisius nuper fuit unus sapiens, qui serpentes quæsit et unum accepit et scidit eum in parva frusta, nisi quod pellis ventris, super quam reperet, remansit integra, et iste serpens repebat ut poterat ad herbam quandam, cuius tactu statim sanabatur. Et experimentator collegit herbam admirandæ virtutis.



science, is a characteristic of Bacon's experimental method. He declares it true that experiment disproves many false notions, but he also asserts that credulity is necessary in experimentation. "First one should be credulous until experience follows second and reason comes third. . . . At first one should believe those who have made experiments or who have faithful testimony from others who have done so, nor should one reject the truth because he is ignorant of it and because he has no argument for it."<sup>38</sup> Taken as a plea for an open minded attitude toward scientific investigation on the part of the ordinary man and of the ecclesiastical authorities, this utterance may be commended; but as a prescription for the scientific investigator it is dangerous. Many of Bacon's 'experiments' are copied from books, and the reproach made against the Greek Empirics that they followed tradition, applies also to him. Describing a certain marvel of nature, he exclaims, "After I beheld this, there was nothing difficult for my mind to believe, provided it had a reliable author."<sup>39</sup> In the midst of his discussion of experimental science we encounter the following instance of his gullibility.

"It is certain that Æthiopian sages have come into Italy, Spain, France, England, and those Christian lands where there are good flying dragons; and, by an occult art that they possess, excite the dragons from their caves. And they have saddles and bridles ready, and they ride the dragons, and drive them at top speed through the air, in order to soften the rigidity and toughness of their flesh, just as boars, bears, and bulls are hunted with dogs and beaten with many blows before they are killed for eating. And when they have tamed the dragons in this way, they have an art of preparing their flesh . . . , which they employ against the accidents of age and prolong life and inspire the intellect beyond all estimation. For no education which man can give will bestow such wisdom as does the eating of their flesh, as we

<sup>38</sup> *Bridges*, 202. Unde oportet primo credulitatem fieri, donec secundo sequitur experientia, ut tertio ratio comitetur. . . . Et ideo in principio debet credere his qui experti sunt, vel qui ab expertis fideliter habuerunt, nec debet reprobare veritatem propter hoc, quod eam ignorat, et quia ad eam non habet argumentum.

<sup>39</sup> *Ibid.*, 219. Postquam enim hoc intuitus sum, nihil fuit meo intellectui difficile ad credendum, dummodo habuit auctorem certum.

have learned without deceit or doubt from men of proved trustworthiness."<sup>40</sup>

Bacon's discussion of experimental science, therefore, on its positive side amounts to little more than a recognition of experience as a criterion of truth and a promulgation of the phrase 'experimental science.'<sup>40a</sup> Let us now look at other writers. Bacon himself, by his copying 'experiments' from other books and by his locating an 'experimenter' even at degenerate scholastic Paris, has suggested that we may find the subject treated elsewhere. We shall not find, it is true, any such express and lengthy discussion of the matter as his, but we may get the same substance in briefer form from the fairly numerous incidental references to experience and experiment.

As for experience as a criterion of truth, as early as the twelfth century we find writers on nature either asserting this or implying it. Early in that century Adelard of Bath in his *Natural Ques-*

<sup>40</sup> *Ibid.*, 211. Nam certum est quod Æthiopes sapientes venerunt in Italiam et Hispaniam et Franciam et Angliam, et in istas terras Christianorum in quibus sunt dracones boni volantes, et per artem occultam quam habent excitant dracones de cavernis suis, et habent sellas et frœna in promptu, et equitant super eos et agitant in ære volatu fortissimo, ut dometur rigiditas carnum et temperetur durities, sicut apri et ursi et tauri agitantur canibus et variis percussioneibus flagellantur, antequam occidantur pro comestione. Cum ergo sic domesticaverint eos, habent artem præparandi carnes eorum, . . . et utuntur eis contra accidentia senectutis, et vitam prolongant et intellectum subtiliant ultra omnem æstimationem. Nam nulla doctrina quæ per hominem fieri potest tantam sapientiam inducere valet sicut esus istarum carnum, secundum quod per homines probatæ fidei didicimus sine mendacio et dubitatione.

<sup>40a</sup> The weak points in Bacon's discussion of experimental science have not hitherto passed wholly unnoticed. Mr. Taylor grants that "even his discussion of experimental science has touches of mediævalism which are peculiarly dissonant in this most original and 'advanced' product of Bacon's genius"; wonders "where the *experimentator* ever observed an eagle or a phoenix renewing its youth, outside of the *Physiologus*?"; and recognizes "how loose must have been the practise or the dreams of his 'experimental science,'" and that "he repeats himself continually in stating its properties and prerogatives, yet without advancing to greater clearness of conception." "His fundamental conception seems to waver: *scientia experimentalis*, is it a science, or is it a means and method universally applicable to all scientific investigation?" (*The Mediæval Mind*, II, 500, 502, 504, 506). And the *Westminster Review* says, "Notwithstanding his forcible language about the prerogatives of experimental science and his bitter invective against frail authority, we find him occasionally resting on authority with childlike faith, and treating his favorite science as if its only prerogative was to provoke a smile." The *Review* then cites some of Roger's absurd 'experiments.' (Vol. 81, p. 241.)

tions attacked exclusive trust in authorities, and, while relying especially upon reason, also adduced experience.<sup>41</sup> Alexander Neckam (1157-1217), who in 1213 was elected Abbot of Cirenchester, in his *De naturis rerum* calls upon "diligent investigators of nature" to testify to the virtues of words, herbs, and stones, which have been demonstrated "by most certain experience."<sup>42</sup> Michael Scot, writing early in the thirteenth century, often uses the word *experimentum* in his elaborate introduction to astrology.<sup>43</sup> So does Vincent of Beauvais later in the century in his huge work on nature, the *Speculum naturale*.<sup>44</sup> The *Thesaurus pauperum* of Peter of Spain, who seems to have become Pope John XXI (died 1277), is further described in its title as, "Or concerning the ills of the human body by experiments ingenious, simple, and particular; an empirical book, from all sorts of authors and my own experience."<sup>45</sup> The scholastic form of the celebrated *Conciliator* of Peter of Abano, composed about 1300 and one of the most elaborate of mediæval medical treatises, makes one scarcely anticipate mention of experience or experiment. Yet Peter couples reason and experience as of equal authority, disagrees with those who deny that medicine is a science because it employs experience as well as reason, and in other passages alludes to his personal astronomical observations and his own successful experimenting with an incantation and an astronomical image.<sup>46</sup>

<sup>41</sup> Adelardus Bathoniensis, *Quæstiones naturales perdifficiles*, Louvain, 1480, Caps. 16 and 18. The British Museum has two copies of this edition (48 leaves and 30 lines to a page), and one copy of an edition with 43 leaves and 32 lines to the page.

<sup>42</sup> Alexander Neckam, *De naturis rerum*, II, 85, in Vol. 34 of the Rolls Series. Neckam's editor, Thomas Wright, declared that "he not infrequently displays a taste for experimental knowledge."

<sup>43</sup> Michael Scot's *Liber Introductorius* exists in manuscripts at Oxford (Bodleian 266) and at Munich (*Cod. Lat.* 10268).

<sup>44</sup> Vincentius Bellovacensis, *Speculum naturale*, Nurembergæ, Anth. Koburger, 2 folio vols. I found this work at the library of the Union Theological Seminary, New York.

<sup>45</sup> Petrus Hispanus, *Thesaurus pauperum*, seu de medendi humani corporis morbis per experimenta euporista simplicia et particularia; liber empiricus ex omni genere auctorum et experientia propria, Frankfurt, 1578. This and most of the medical works which follow I consulted at the John Crerar Library, Chicago. Peter was really born in Lisbon (*Histoire Littéraire de la France*, Vol. XIX, 322 ff.).

<sup>46</sup> Pietro d'Abano, *Conciliator differentiatum philosophorum et medicorum*, Venice, 1526. Diffs. III, IX, CXIII, and X; or fols. 5, 14, 154, 16 and 15.

A favorite theory in the twelfth and thirteenth centuries is that the things of nature possess 'occult virtues' which cannot be reasoned out but must be learned experimentally. The hypothesis was still in force<sup>47</sup> that all natural objects were composed of only four elements, earth, air, fire, and water, and characterized by four qualities, hot, cold, dry, and moist. It was impossible even by the most ingenious reasoning to explain on this basis certain properties of objects, such as the action of the magnet. So men decided that things possessed occult virtues in addition to the qualities which they derived from their component elements. Many believed that these occult properties were due to the influences of the stars; but in any case all agree that they can only be discovered by experience. General principles and logic give no clue to them. Peter of Abano writes, "We perceive that precious stones and medicines have marvellous and occult virtues which cannot come from the qualities and natures of the elements. . . . Effects of this sort cannot be investigated by reasoning based on the qualities of the elements, but rather by experience."<sup>48</sup> In the same strain write Arnald of Villanova,<sup>49</sup> a medical author who died in 1312, Thomas Aquinas,<sup>50</sup> Albertus Magnus,<sup>51</sup> and others.

Indeed, writers on Albertus Magnus have not failed to notice that his scientific writings are neither mere commentaries upon Aristotle, nor compilations from a variety of sources; but that he both recognizes experience as a criterion of truth, and frequently states the results of his personal observations. This

<sup>47</sup> It of course came down from the classical period.

<sup>48</sup> *Conciliator*, Diff. LX, fol. 83. Conspicimus etiam lapides preciosos et medicinas virtutes mirabiles et occultas habere que ex qualitatibus et naturis non possunt consurgere elementorum. . . . Huiusmodi actiones per rationes a qualitatibus sumptas elementorum investigari non possunt sed per experientiam magis. . . .

<sup>49</sup> See his *Medicinalium Introductionum Speculum*, Cap. 18; *Repetitio super Canon 'Vita brevis'*, fol. 127 in his *Opera* as edited at Lyons, 1532; *De parte operativa*, fol. 276 in his *Opera*, Lyons, 1532. This edition was lent to me by the Harvard University Library.

<sup>50</sup> See his *De occultis operibus naturæ ad quemdam militem*, Vol. 27, pp. 504-7 in Fretté et Maré's edition of his *Opera*, Paris, 1871-1880; *Summa*, secundæ secunda, Quæst. 96, Art. 2.

<sup>51</sup> See his *De mineralibus*, Liber II, Tract. I; *De veget. et plantis*, V, II, 6. I have used Borgnet's edition of Albert's works, Paris, 1890-1899, 38 vols.

becomes especially evident in the last few books of his treatise on animals where he often states, "I have tested this," or "I and my associates have experienced,"<sup>52</sup> or "I have proved that this is not true," or "I have not experienced this."<sup>53</sup> In treating of whales he limits himself entirely to the results of his own experience, saying, "We pass over the writings of antiquity on this topic because they do not agree with experience."<sup>54</sup> Albert also often expresses doubt as to certain statements concerning animals on the ground that they have not been tested by experience, even if he has had no opportunity to disprove them; and he draws a sharp distinction between authors who state what they themselves have seen or tested, and those who appear simply to repeat rumor or folk-lore.<sup>55</sup> He is particularly chary of accepting the assertions of Solinus and Jorach, assuring us, anent their assertion that certain birds can fly unharmed through flames, "Those philosophers tell many lies and I think that this is one of their lies."<sup>56</sup>

On the other hand, Albert accepts as the statements of men of experience the stories which hunters, fowlers, and fishermen have told him. Toward such contemporary personal testimony he is, like Bacon, unduly credulous. He says that "a trustworthy person" told him that he saw in an eagle's nest 300 ducks, over 100 geese, about 40 hares, and many large fish, all of which were required to satisfy the hunger of the young eagles.<sup>57</sup> However, Albert is somewhat less credulous than Bacon on the

<sup>52</sup> *De animalibus*, 22, 2, 10; 22, 2, 99; 23, 1, 83; 23, 1, 5; 23, 1, 34; 23, 1, 35; 24, 1, 123, sicut olim in hac scientia probavimus; 26, 1, 10, experti sumus ego et socii mei; 26, 1, 14; 26, 1, 20.

<sup>53</sup> *Ibid.*, 23, 1, 23, experimento probavimus falsum esse; 23, 1, 57, probavi in quibusdam verum non esse; 23, 1, 9; 23, 1, 83; 23, 1, 14; 23, 1, 104.

<sup>54</sup> *Ibid.*, 24, 1, 28. Hæc sunt quæ de cetorum natura nos experti sumus, et ea quæ scribunt Antiqui præterimus quoniam non concordant cum expertis.

<sup>55</sup> *Ibid.*, 23, 1, 40, caps. 18, 20, 21; 25, Introd.; 23, 1, 54, Gryphes aves esse magis tradunt historiae quam experta Philosophorum vel rationes philosophiæ; 23, 1, 93, Hæc autem potius in historiis leguntur quam sint experimento per philosophiam probata; 23, 1, 101; 26, 1, 47, Sed hoc licet sit famosum tamen a rumore vulgi potius acceptum est quam certo experimento probatum sit.

<sup>56</sup> *Ibid.*, 23, 1, 22. Sed illi philosophi multa mentiuntur et puto quod hoc sit unum de mendaciis eorum. See also 22, 2, 56, Sed iste Jorach frequenter mentitur; 25, 1, 5. Et sicut in multis mentitur Solinus ita et in hoc falsum dicit; 23, 1, 55. Statements by Pliny the Elder are rejected by Albert in 23, 1, 9; 25, 1, 13; 25, 1, 26.

<sup>57</sup> *Ibid.*, 23, 1, 9; also 22, 2, 19, and 24, Introd.

subject of dragons. That the Æthiopians eat the flesh of dragons to cool themselves, that dragons are afraid of thunder and therefore enchanter's imitate the noise of thunder with drums in order to capture dragons and ride on them through space, that a dragon by a coil of its tail can crush an elephant: all these reports Albert treats as rumors rather than tested facts.<sup>58</sup> He also suggests that meteors or flaming vapors have been mistaken for dragons flying through the air and breathing forth fire. He has, however, "heard from trustworthy persons" that a serpent with the virgin countenance of a beardless man "was slain in an island of Germany and there displayed in our times to all who wished to see it until the flesh putrefied."<sup>59</sup> Albert also still states that adamant can be broken only by goat's blood, an error which Bacon rejects.<sup>60</sup> On the other hand, one notion which Bacon himself attacks but which he represents as generally accepted, namely, that the beaver when hunted castrates itself to save its life, Albert also rejects, saying that experience near his home has often proved the contrary.<sup>61</sup> Again, Bacon tells how he himself has profitted by an 'experiment' which the magicians pretend to perform by virtue of an incantation. The experiment consists in holding the split halves of a hazel rod apart at the two ends, whereupon the middle portions bend toward each other. Bacon says, "I omitted the incantation and discovered a marvel of nature."<sup>62</sup> But Albert and also John of St. Amand, a medical writer about 1261, both narrate this same marvel of nature and assure us that it works without the incantation.<sup>63</sup>

<sup>58</sup> *Loc. cit.*, 25, I, 26.

<sup>59</sup> *Ibid.*, 25, I, 28. Talem serpentem a fide dignis audivi interfectum esse in insula Germaniæ et diu monstratum nostris temporibus omnibus volentibus eum videre donec computruit.

<sup>60</sup> Albertus Magnus, *De mineralibus*, II, ii, 1.

<sup>61</sup> *De animalibus*, 22, 2, I, 21; and Bridges, II, 168-9. See further Pouchet, 285-6.

<sup>62</sup> Bridges, II, 219. Et ego neglexi carmina et inveni opus naturæ mirabile.

<sup>63</sup> *De veget. et plantis*, VI, i, 29; John of St. Amand, *Expositio in Antidotarium Nicolai*, fol. 268 in *Mesua medici clarissimi opera*, Venice, 1568. John, however, states that the witches do not assert that their incantations make the sticks bend toward each other, but that the incantations prevent the rods from joining in case the marriage concerning which the witch is consulted is one destined to result unhappily.

It is true that Albert's allusions to experience occur mainly when he is discussing the specific properties of particular things. In his treatise on animals we find such allusions in the books where he is listing and describing particular animals, rather than where he discusses the general natures and common characteristics of animals. This is true again in his treatise *On Vegetables and Plants* where allusions to experience occur especially in the sixth book, in which particular plants are listed and described and, as Albert says, "We satisfy the curiosity of our students rather than philosophy, for philosophy cannot deal with particulars."<sup>64</sup> However, in his *Physics* Albert states that "every hypothesis which is confirmed by the senses is better than that which contradicts sense; and a conclusion contrary to sense is incredible: indeed, a principle which does not agree with *experimental knowledge* acquired by the senses is no principle but quite the opposite."<sup>65</sup>

Other authors than Bacon not only rely on experience, they also mention 'experimenters' and cite experimental books or 'books of experiments.' In short, others than he have conceived the possibility of purposive experimentation, although we find their ideas as to experimental method in the same crude state as his. Bernard Silvestris, a teacher at Tours in the first half of the twelfth century, entitled an astronomical treatise which he composed *Experimentarius*.<sup>66</sup> Early in the thirteenth century Thomas of Cantimpré, in the preface to his *De naturis rerum*, cites "a certain book without name of author which I have heard was compiled in modern times, whose statements you will know wherever you meet them from this indication, that you will find the name *Experimentator* (experimenter) prefixed."<sup>67</sup>

<sup>64</sup> *De veget. et plantis*, VI, i, 1. In hoc sexto libro Vegetabilium nostrorum magis satisfacimus curiositati studentium quam philosophiæ, de particularibus enim philosophia esse non poterit.

<sup>65</sup> *Physic.*, VIII, ii, 2. Omnis autem acceptio quæ firmatur a sensu, melior est quam illa quæ sensui contradicit; et conclusio quæ sensui contradicit est incredibilis: principium autem quod experimentalis cognitioni in sensu non concordat, non est principium, sed potius contrarium principio.

<sup>66</sup> Clerval, *Les Écoles de Chartres*, Chartres, 1895, p. 240.

<sup>67</sup> Cited by the *Histoire Littéraire de la France*, Vol. 30, pp. 371-2. Invenies etiam librum quemdam suppresso auctoris nomine quem modernis temporibus compilatum audivi, cuius sententiæ ubique reperiis ex hoc cognosces quod hoc nomen 'Experimentator' subsequentibus invenies prælibatum.

The *Speculum astronomiæ*, a treatise probably written by Albertus Magnus, mentions a *Book of Experiments* by the Arab Albumasar;<sup>68</sup> Arnald of Villanova attributes a book of experiments to another Arab, Rasis.<sup>69</sup> Bernard Gordon cites the opinions of "experimenters" in his *Lilium medicinæ* which he began to write in 1303.<sup>70</sup>

As Bacon's experimental scientist was "ashamed to have some layman or old-wife or knight or rustic know facts of which he is ignorant," so Arnald of Villanova admits that the practical man of experience may know more of nature than the bookish scholar. "For since the properties of things cannot be discovered by reason but only by experiment or revelation, and experience and revelation are common to the ordinary man and to the scholar, it is possible that knowledge of properties may be attained by the common people sooner than by others."<sup>71</sup> Arnald not only speaks of "experimenters" but of a "philosopher and experimenter"<sup>72</sup>; and in another treatise states that a certain hypothesis "can be satisfactorily proved by the long experience of any intelligent operator."<sup>73</sup> He also speaks of "rational experiment" which "always presupposes a determined object."<sup>74</sup>

John of St. Amand asserts that *experimentum* alone is "timorous and fallacious," but that "fortified by reason" it gives "experimental knowledge." His idea seems to be, not only that experience must be combined with theory, but also that there should be methodical experimentation. He gives seven rules to be observed in discovering experimentally the properties of medicinal simples: that the simple tested should be pure and free from every extraneous quality, that it should be tested in a

<sup>68</sup> *Speculum astronomiæ*, Cap. 7.

<sup>69</sup> *Opera*, Lyons, 1532, fol. 276.

<sup>70</sup> Bernard Gordon, *Lilium medicinæ*, Venice, 1496, fol. 159 (Pars V, Cap. 12).

<sup>71</sup> From his *Repetitio* super Canon 'Vita brevis,' *Opera*, Lyons, 1532, fol. 276. Nam cum notitiam proprietatum non possit haberi per rationem sed tum experimento vel revelatione, et experientia et revelationes sunt communes vulgo et sapientibus, possibile est ut proprietatum notitiæ prius habeantur a vulgaribus quam ab aliis.

<sup>72</sup> *Regimen podagræ*, fol. 210-211 in the *Opera*.

<sup>73</sup> *Regulæ generales curationis morborum*, Doctrina IV. Quod potest valde bene haberi per experientiam longam cuicumque operanti et intelligenti.

<sup>74</sup> *Medicinalium Introductionum Speculum*, Cap. 19. Rationabile enim experimentum semper præsupponit determinatum obiectum.



simple and not a complex disease, that several tests be made, that the dose administered should be proportioned to the patient's constitution, and so on.<sup>75</sup>

On the whole one rather gets the impression that the experimental method which Bacon pleads for, as if it were a novelty, is calmly assumed by other writers as a well-established method. It is even doubtful if Roger can be credited with having coined a new phrase in 'experimental science,'<sup>75a</sup> since not only do others employ the adjective 'experimental' and the noun 'experimenter,' but both Albertus Magnus and John of St. Amand use the expression 'experimental knowledge.'

It is significant that others not only duplicate Bacon's positive contributions, but that their experimental method is characterized by precisely the same failings as his. They display the same credulity and love of the marvelous, and are especially prone to mention experiment when they wish to prove something unreasonable, and to support incredible assertions by assurances that they have been tested by experience. They show the same inclination to fantastic 'experiments.' What Arnald's "experimenters" have proved is that a frog's legs bound to the patient's feet for three days, with the right leg on the right foot and the left leg on the left foot, cure gout. What his "philosopher and experimenter" has demonstrated is that application of the magnet has the same effect. To Socrates Arnald attributes this "marvellous and choice experiment." "In young swallows are found two stones, one red and one white. Application of the white stone will raise up a falling lunatic; and the red stone will benefit him, if tied in a bit of skin about his neck."<sup>76</sup> Albert matches Bacon's snake experiment

<sup>75</sup> *Expositio in Antidotarium Nicolai*, fol. 231 in *Mesue medici clarissimi opera*, Venice, 1568.

<sup>75a</sup> Sebastian Vogl, *Die Physik Roger Bacon*, Erlangen, 1906, p. 17, says of *scientia experimentalis*, "Diese Bezeichnung tritt in seinem Werken zum erstenmal auf und verschwindet von da ab nicht mehr." Franz Strunz, *Geschichte der Naturwissenschaften im Mittelalter*, Stuttgart, 1910, 120 pp. (no references), also says of *scientia experimentalis*, "Das Wort steht hier bei diesem Gelehrten das erstenmal" (p. 97).

<sup>76</sup> *De epilepsia* (fol. 311 ff. in the *Opera*), Cap. 4. Socrates vero recitat hoc experimentum pro mirabili et electo: in pullis inquit irundinum inveniuntur duo lapides quorum unus est rubens, alter est albus; albus quidem lunatico cadente appositus levabit eum; rubens autem acceptus et ligatus in pelle collo ei apponitur.

by one with a toad and emerald, which he tells to illustrate "the many effects of stones and plants that are known by experience and by which wonders are worked."

"An emerald was recently seen among us, small in size but marvelous in beauty. When its virtue was to be tested, someone stepped forth and said that, if a circle was made about a toad with the emerald and then the stone was set before the toad's eyes, one of two things would happen. Either the stone, if of weak virtue, would be broken by the gaze of the toad; or the toad would burst, if the stone was possessed of full natural vigor. Without delay things were arranged as he bade; and after a short lapse of time, during which the toad kept its eye unswervingly upon the gem, the latter began to crack like a nut and a portion of it flew from the ring. Then the toad, which had stood immovable hitherto, withdrew as if it had been freed from the influence of the gem."<sup>77</sup>

The following experiment with a religious tinge was a favorite with medical writers. I quote John of Gaddesden's version.

"Since many boys and others who cannot take medicine are troubled with epilepsy, let the experiment be performed which Constantinus gives in the chapter on epilepsy in the fifth book of his *Practica*, and Walter in his *Practica*, and Bernard, and Gilbert, and everyone. And I have found it true, whether the patient be a demoniac, or epileptic, or lunatic. If he has a father and mother, let them take him to church after fasting with him for three days, and let him make confession, provided he has reached years of discretion. Then let them go on Friday in the fast of four seasons and hear mass, and let them repeat this on Saturday. On Sunday let a good religious priest read in church over the patient's head the Gospel which he reads in

<sup>77</sup> *De veget. et plantis*, VI, ii, 1. Smaragdus enim nuper apud nos visus est parvus quidem quantitate et mirabiliter pulcher, cuius cum virtus probari deberet, adstitit qui diceret, quod si circa bufonem circulus smaragdo fieret et postea lapis oculis bufonis exhiberetur, alterum duorum, quod aut lapis frangeretur ad visum bufonis si debilem haberet lapis virtutem, aut bufo rumperetur si lapis esset in naturali suo vigore: nec mora factum est ut dixit et ad modicum temporis intervallum, dum bufo adspiceret lapidem nec visum averteret ab ipso, crepitare coepit lapis sicut avellana rumperetur et exilivit ex annulo una pars eiusdem, et tunc bufo qui ante stetit immobilis, cœpit recedere ac si absolutus esset a lapidis virtute.

September after the harvest feast of the holy cross in the days of the four seasons. Moreover, let him devoutly write the same, and let the patient wear it about his neck and he will be cured. The Gospel meant is the passage, 'This kind of demon is not cast out except by fasting and prayer.'"<sup>78</sup> Many more such 'experiments' might be given.

In reality, therefore, Bacon's discussion of experimental science, instead of being a wonderful original contribution to knowledge, is an excellent representation of both the good and bad points of an important movement of the time in the direction of experimental method. Crude as this tendency may be, it at least demonstrates that the interests of the period were not exclusively scholastic.

Two further questions concerning experimental method in the middle ages suggest themselves. Was there any positive advance in this respect over the science of the classical period? How are we to explain the association of so much superstition with experimental method?

To the former question I incline to answer, Yes. Pliny the Elder, whose *Natural History* (written in the first century of our era) was a compilation of all previous science, should know of experimentation if it had ever amounted to much hitherto. He frequently uses the word *experimentum* but seldom in such a way that it is best translated 'experiment.'<sup>79</sup> He never uses

<sup>78</sup> John of Gaddesden, *Rosa medicina* (written in the early fourteenth century). Papiæ, 1492 (Joannes antonius birreta impressioni tradidit). Et cum multi pueri et alii qui non possunt uti medicinis vexantur epilepsia, fiat experimentum quod ponit Constantinus 5 practicæ suæ c. de epilepsia, et Gualterius in practica sua et Bernardus et Gilbertus et omnes. Et ego inveni illud verum sive sit demoniacus sive lunaticus sive epilepticus. Si patrem habet et matrem, ducant eum ad ecclesiam facto jejunio trium dierum a parentibus et a patiente, si sit tantæ ætatis quod sit compos sui, et confiteatur. Deinde vadant die veneris in jejunio quatuor temporum et audiant missam de die et similiter in die sabbati. Die dominica sequenti sacerdos bonus religiosus legat supra caput patientis in ecclesia evangelium quod legit in septembri tempore vindemiarii post festum sanctæ crucis in diebus quatuor temporum. Tunc etiam scribat illud idem devote et portat circa collum et curatur; et est evangelium ubi dicitur, Hoc genus demonii non ejicitur nisi in jejunio et oratione. The same recipe occurs in Bernard Gordon's *Lilium medicina*, Partic. II, Cap. 25, fol. 76.

<sup>79</sup> Often it simply means experience, as in the passage, "Let him marvel at this who has not observed by daily experience that the herb called heliotrope always

the words 'experimental' and 'experimenter', which are post-classical. Several of our mediæval writers cite Galen as an authority for the recognition of experience as a criterion of truth.<sup>80</sup> It is true that Galen, writing a century later than Pliny and showing an advance in anatomical and medical knowledge over his predecessors, approaches more closely the conception of experimental method. He himself engaged in original research in anatomy, dissecting and vivisectioning, and proving by actual experiment that the arteries contain blood, not air.<sup>81</sup> It is true, as John of St. Amand and Peter of Abano state, that Galen makes both reason and experience criteria of truth in medicine;

turns toward the sun." II, 41, 2 (Edition by Lemaire, Paris, 1827): see also, II, 41, 1; II, 108, 1; VII, 41, 2; VII, 56, 3; XIV, 8, 2; XVI, 1, 3; XVII, 2, 3, and 12; XVII, 35, 9; XX, 52, 1; XXII, 51, 2; XXIII, 59, 1; XXV, 106, 2. Again it may be rendered as "example" or "actual instance," as when Pliny says, "We have instances (experimenta) and examples (exempla) in the last census" of men who have lived over 120 years. VII, 50, 3; also, II, 54, 2; VIII, 7, 2; IX, 86, 1; XXII, 49, 5; XXVIII, 45, 2. Or it may mean use, as in the passage, "Reeds useful in both war and peace," or where it is stated that most plants "have been recommended for frequent use by their edibility or odor or beauty," XVI, 64, 1; and XXII, 1, 1. When Pliny tells that Claudia was shown to be chaste by a religious ordeal, the phrase used is, "religionis experimento," VII, 35, 1. Often the word means 'test,' as when Pliny discusses ways of testing the genuineness of gems, the freshness of eggs, and the realism of paintings: see V, 1, 12; X, 75, 1; XIII, 3, 1; XIV, 25, 7; XVII, 4, 2; XX, 3, 1; XX, 76, 5; XXII, 23, 1; XXIII, 31, 1; XXVIII, 7, 2; XXIX, 12, 1; XXXI, 27, 2; XXXI, 28, 2; XXXIII, 19, 2, and 43, 1, and 44, 1, and 57, 2; XXXIV, 26, 3, and 39, 2; XXXV, 36, 2; XXXVI, 38, 1, and 55, 2; XXXVII, 22, 1, and 76, 1-2. Purposive action is clearly suggested in only a few cases: namely, where Pliny says that experiments cannot entirely duplicate nature in the grafting of trees; where he describes as an experiment the marking of a dolphin's tail in order to learn the dolphin's age, if it should be caught again; where a well was sunk to prove that the sun casts no shadow at noon of the summer solstice; and where a man was cast into a pit of serpents at Rome to discover if he really was immune from them. XVII, 26, 3; IX, 7, 2; II, 75, 1; XXVIII, 6, 1; and perhaps, XXVIII, 14, 3; XXIX, 4, 1, and 8, 3.

Of course, in the middle ages, too, the word 'experimentum' does not always carry the meaning of experiment. It may indicate experience, or be used of the results of experience. Recipes as well as procedures, often mere lists of ingredients which are to be tried or are supposed to have been successfully tested as remedies against various diseases, are often called 'experimenta' by medical writers. Thus Bernard Gordon gives nine 'experimenta' for eye troubles. *Lilium medicinae*, Partic. III, Cap. 5, fol. 94.

<sup>80</sup> Pietro d'Abano, *Conciliator*, Diff. X, fol. 15; Diff. LX, fol. 83. Jean de Saint-Amand, *Expositio in Antidotarium Nicolai*, fol. 231. Arnald of Villanova, *Repetitio super Canon 'Vita brevis'*, fol. 276.

<sup>81</sup> See Vol. II, pp. 642 and 646-649; IV, 703-36 in Kuhn's edition of Galen.

but as he insists that they ought not to be employed simultaneously, he misses the essence of experimental method. He further objects that experience is unscientific, irrational, and that it "requires good fortune to find what is sought." Once he identifies it with mere observation.<sup>82</sup> The Empirics were the chief advocates of experience in the ancient medical world, and Galen broaches the topic mainly in connection with allusions to their sect. He usually depicts them as over-emphasizing experience and neglecting reason, as regarding phenomena only and ignoring causes, as learning what drugs to use from dreams and chance, and as trusting unquestioningly in authorities and tradition for information concerning the experience of past ages.<sup>83</sup> The Empirics themselves insisted that experience was a scientific method.<sup>84</sup> They distinguished three kinds, of which Galen unfortunately gives no further description, namely, accidental, off-hand, and imitative.<sup>85</sup> They held that observation of a single instance was not enough, but that repeated observation with things remaining in the same condition was necessary.<sup>86</sup> Thus they seem both to have had some of the faults of our mediæval scientists and to have had at least some notion of controlling the results of experience. Indeed, Galen himself believes that the properties of medicinal simples can and should be learned from experience, and gives some rules for testing their effects from which John of St. Amand seems to have developed his longer directions.<sup>87</sup> Admitting, however, the debt of the middle ages to Galen, it seems true that they rely more frequently on experience than the ancients did; that they apply it more generally through the field of science, rather than merely to medicinal simples as Galen did, or to medical practise as the Empirics did; that they have developed the theory of occult virtues which can be discovered only by experience; that they have 'experiments' and 'experimenters' and entire books called

<sup>82</sup> Kuhn, X, 28-31; also I, 131 and 138; XIV, 675-6.

<sup>83</sup> Kuhn, XIV, 220 and 245, 679-680; I, 143; also XVI, 82; I, 76 and 134.

<sup>84</sup> Kuhn, I, 76.

<sup>85</sup> Kuhn, XVI, 82.

<sup>86</sup> Kuhn, I, 135.

<sup>87</sup> Kuhn, XVI, 85-87; XI, 485 and 518.

experimental. Others besides Bacon seem conscious that science is finding a new method in their day, and Peter of Spain, in stating his sources of information, speaks of "ancient philosophers" but of "modern experimenters."<sup>88</sup>

As for the other matter, the credulity, the superstition, the element of marvelousness, which seem to vitiate the experimental tendencies of Bacon and his contemporaries,—these are to be explained as the result of a real connection between experiment and magic. There is abundant evidence for this. Bacon, it is true, asserts that experimental science exposes and shuns all the follies of the magicians, but he admits that many persons confuse it with magic because of the marvels which it works, and he himself especially associates it with the occult sciences of alchemy and astrology. It makes gold such as neither the art of alchemy nor nature can produce; it can predict the future better than astrology.<sup>89</sup> It teaches one to choose the proper constellations for his undertakings, and to use the right words at the proper times;<sup>90</sup> it can construct "philosophical images and incantations and characters" which are vastly superior to those of magic;<sup>91</sup> it can alter the world about us, and incline and excite the human will, though without coercion.<sup>92</sup> Moreover, Bacon's ideal experimental scientist does not scorn to take hints from wizards, while Roger himself derives his hazel rod experiment from the magicians. The snake experiment of his sage at Paris sounds more like the trick of a Hindu conjurer than the procedure of a modern laboratory.

One gets the same impression from Bacon's contemporaries. The conception of occult virtue, which leads them so often to rely on experience, is a more or less magical notion, akin to the *mana* of primitive magic.<sup>93</sup> Believers in astrology, divination, and fascination also appeal to experience. Vincent of Beauvais

<sup>88</sup> Petrus Hispanus, *Thesaurus pauperum*, Frankfurt, 1578, Preface. In libris antiquorum philosophorum et modernorum experimentatorum.

<sup>89</sup> *Little*, 46; *Gasquet*, 510.

<sup>90</sup> *Little*, 52.

<sup>91</sup> *Ibid.* 53.

<sup>92</sup> *Gasquet*, 510. Opera vero istius scientie quedam naturalia sunt in alteratione mundi, quedam in excitationem et inclinationem voluntatum sine coactione.

<sup>93</sup> For "L'idée de *mana*" see H. Hubert et M. Mauss, "Esquisse d'une Théorie Générale de la Magie," *L'Année Sociologique*, 1902-03, pp. 1-146, especially 109 ff.

says that divination from portents is proved by many experiences, and that the influences of the planets upon our world were discovered by philosophers by "sure experiments" as well as by "convincing arguments."<sup>94</sup> Albertus Magnus assures the reader that divination from dreams is "no idle report but the testimony of experience."<sup>95</sup> In another treatise which has sometimes been attributed to Albert we read, "When the soul of any person is raised to great excess of some passion, it is found by manifest experiment that it binds and alters objects as it wishes."<sup>96</sup> The experiments of Bacon's contemporaries, too, are often more like feats of magic than like scientific tests. Gaddesden's experiment employed an incantation and amulet. Peter of Abano experimented with an incantation and an astronomical image; and a necromantic book attributed to him bears the sub-title, "A book of marvellous experiments."<sup>97</sup> Michael Scot describes "a chiromantic experiment," and mentions "love experiments" and the experiments of necromancers and magicians.<sup>98</sup> Arnald recounts an "experiment" performed by an old-wife of Salerno to help women in childbirth. It consisted in taking three grains of pepper; saying a Lord's Prayer over each with substitution of the sentence, "Deliver this woman from the pangs of childbirth," for the words, "Deliver us from evil"; giving the grains one by one to the woman to be swallowed in wine or water without touching the teeth; and finally uttering this incantation with three Paternosters in her right ear,

<sup>94</sup> *Speculum naturale*, XXXII, 119; XVI, 43.

<sup>95</sup> *De somno et vigilia*, III, i, 2. Est enim hoc non auditus inanis sed experientiae testimonium.

<sup>96</sup> *De mirabilibus mundi*, p. 159 in an edition of Amsterdam, 1740 (Columbia University Library), where it is bound with the *De secretis mulierum*. These works are omitted from Borgnet's edition, but there are no very convincing reasons for doubting Albert's authorship. The passage reads, "Cum igitur anima alicuius fertur in grandem excessum alicuius passionis, invenitur experimento manifesto quod ipsa ligat res et alterat ad idem quod desiderat."

<sup>97</sup> *Heptameron seu elementa magica*; bound with the *Opera* of H. C. Agrippa Lyons, 1600, pp. 441-462 (Cornell University Library).

<sup>98</sup> *De secretis naturæ* (a portion of Scot's long work on astrology which is printed in the edition of Amsterdam, 1740, mentioned in note 96), Cap. 18, In chiromantia est illud experimentum, etc. Bodleian ms. 266, fol. 22 v. quotiens nigromantici vel magi volunt experimentorum aliqua operari veraciter; and fol. 106 r. hec stella est multe efficacie ad experimenta amoris.

Bizomie lamion lamium azeraï vachina deus deus sabaoth  
Benedictus qui venit in nomine domini osanna in excelsis.

Arnald condemns this procedure as diabolical and contrary to the Faith, but he calls it an experiment nevertheless; and earlier in the same treatise describes approvingly a very similar experiment by which a priest cured him of warts.<sup>99</sup> Albert concludes his tale of the toad and the emerald by stating that there are many other effects of stones and herbs, which we learn by experiment, and which magicians study, and work wonders by means of them.<sup>100</sup> In the *Speculum astronomiæ* he calls "experimental books" those which deal with different varieties of divination, namely, aeromancy, pyromancy, hydromancy, geomancy, and chiromancy; and he declares that such books ought not to be called science,<sup>101</sup> which recalls Bacon's remark that to some men experimental science seems false and unworthy of a Christian. In a treatise entitled *Apollonii Flores aurei*,<sup>102</sup> which treats of the Notory Art of miraculous acquisition of knowledge by incantations and invocation of spirits, experiments and experimental science are again mentioned in the same breath with the above named varieties of divination. Books "which are nigromantic or contain the experiments of lot-casters" were condemned at Paris in 1277 together with the opinions of Siger de Brabant.<sup>103</sup>

This is not the place to discuss magic, but from further investigation which I have made of its history and its relations to science<sup>104</sup> I have little doubt that the connection between it and

<sup>99</sup> *Breviarium* (fols. 150-205 of the *Opera*), III, 4; and II, 45.

<sup>100</sup> *De veget. et plantis*, VI, II, I. Sunt autem multi alii effectus lapidum et plantarum qui experimento accipiuntur in eosdem in quibus student magici et mira per eos operantur.

<sup>101</sup> *Speculum astronomiæ*, Cap. 17.

<sup>102</sup> This treatise is contained in two manuscripts of the fourteenth century at Munich, *Cod. Lat.* 268 and 276. See fols. 5-6 of the latter.

<sup>103</sup> Denifle et Chatelain, *Chartularium Universitatis Parisiensis*, I, 543. Libros, rotulos, seu quaternos nigromanticos aut continentes experimenta sortilegiorum.

<sup>104</sup> Lynn Thorndike, *The Place of Magic in the Intellectual History of Europe*; New York, 1905. "The Attitude of Origen and Augustine to Magic," *The Monist*, XVIII, 46-66 (January, 1908). "Julius Firmicus Maternus, A Roman Astrologer as a Historical Source," *Classical Philology*, VIII, 415-435 (October, 1913). An article on "Some Mediæval Conceptions of Magic" will soon appear in *The Monist*.



experimentation which our authors suggest is real. But this is not so much to the discredit of science as it is to the credit of magic. After all it is not surprising that magic, which was curious and tried to do things and to attain practical results, and which as long ago at least as Pliny the Elder's day had investigated nature,<sup>105</sup> should experiment. It is indeed possible that magicians were the first to experiment, and that science, originally speculative, took over experimental method, as well as the conception of occult virtue, from magic.

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<sup>105</sup> The *magi* stand out in the pages of Pliny's *Historia naturalis*, not as mere sorcerers or enchanterers, but as those who have gone farthest and in most detail,—too curiously, in Pliny's opinion—into the study of nature.



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## SOME MEDIEVAL CONCEPTIONS OF MAGIC.\*

MAGIC is attracting attention to-day. Students of folk-lore and of the history of religion cannot afford to neglect it. Anthropologists have found that it colors much of the life of primitive man, and sociologists have begun to deal with it as an important social manifestation. It occupies no small part of the written remains of Assyria and Babylonia and of the Greek papyri; in fact, its traces are evident throughout the literatures of Hellas and of Rome. The middle ages too, although they have as yet received little attention from serious modern students of magic, were a time when there was a great deal of magic and no little talk about it.

It may help us in forming a satisfactory definition and theory of magic for our own use, if we note some previous definitions of it by men who actually lived in the midst of it and believed in it. In the case of the savage we apply our term "magic" to certain of his practices, but medieval men used the very same word "magic" as we, and on the whole the extant writers of the twelfth and thirteenth centuries discuss magic more fully and directly than those even of the days of the elder Pliny and Apuleius. The present article will set forth a number of discussions of magic or significant allusions thereto in books and writers of the twelfth and thirteenth centuries. Space will not permit me to give even an idea of the vast collection of

\*The author has not seen proofs of this article, owing to his absence abroad.

medieval beliefs and practices which one might classify as magic. We must limit ourselves to a few authors who define magic and omit the many who illustrate the thing without designating it by that name.

THE "POLYCRATICUS" OF JOHN OF SALISBURY.

We turn first to *Polycraticus*,<sup>1</sup> written about 1159 by John of Salisbury, who studied and taught in various schools of western Europe, then was long employed in official church business, and finally became bishop of Chartres in 1176. The *Polycraticus* seems designed as somewhat light reading for the cultured public, and treats such "trifles" (*nugae*) as gambling, hunting, the theater and music. John confesses that the book is little more than a patchwork of others' opinions without acknowledgment of authorities; what he probably prides himself on most is the Latin style and the numerous quotations from classical and Christian authors. In short, it is a conservative work, repeating traditional attitudes in an attractive, dilettante literary form and with such rational criticism as some study of the classics may be supposed to produce when qualified by scrupulous adherence to medieval Christian dogma.

John's discussion of magic is what one might expect from these premises. He gives, except for slight changes in arrangement and wording and the introduction of a few new items of information, a stock definition prevalent among Christian writers at least since the time of Isidore of Seville. In his *Etymologies* (VIII, 9) Isidore put together from such sources as Pliny the Elder, Jerome, and Augustine an account of the history and character of the magic arts which would fill about five ordinary pages. This passage, somewhat altered by omitting poetical quotations or inserting transitional sentences, was otherwise copied

<sup>1</sup> Johannes de Saresberia, "Polycraticus sive De nugis curialium et vestigiis philosophorum," Migne's *Patrologia Latina*, Vol. 199.

word for word by Rabanus Maurus in his *De consanguineorum nuptiis et de magorum praestigiis falsisque divinationibus tractatus*, and by Burchard of Worms and Ivo of Chartres in their respective *Decreta*, while Hinemar of Rheims in his *De Divortio Lotharii et Tetbergae* copied it with more omissions.<sup>2</sup> It was also in substance retained in the *Decretum* of Gratian, whose epoch-making work in canon law appeared in the twelfth century.

This stereotyped theological definition of magic regards it not as one of many superstitions or occult arts, but as a generic term covering various superstitions and occult sciences. Very sweeping are the powers attributed to magicians. "The magicians, so-called on account of the magnitude of their evil deeds, are those who by divine permission agitate the elements, strip objects of their forms, often predict the future, disturb men's minds, despatch dreams, and slay by mere force of incantation." Magic thus includes prediction of the future as well as transformation of nature and bewitching of human beings. It subdivides into *praestigia* or illusions; *maleficia* or sorcery, literally "evil deeds"; and "various species of evil *mathematica*," a word used here in the sense of divination. Varro, "most curious of philosophers," distinguished four kinds of divination from the four elements, namely, pyromancy, aeromancy, hydromancy, and geomancy. Under these four heads, John asserts, are to be classed many sub-varieties. His list, however, includes some arts which might better be put under *praestigia* or *maleficia* than under divination. He names necromancers, enchanters, *vultivoli* (sorcerers employing human effigies of wax or

<sup>2</sup> Migne, *Patrologia Latina*, Vol. 199, cols. 406-409; 110: 1007-1110; 140: 839ff; 161: 760ff; and 125: 716-729. Moreover, Burchard continues to follow Rabanus word for word for some ten columns after the conclusion of their mutual excerpt from Isidore, while Ivo is identical with Burchard for 15 more columns. I think that I am the first to point out the identity of these five accounts. Professor Burr, in a note to his paper on "The Literature of Witchcraft" (*American Hist. Assoc. Papers*, IV, 241, 1890) has described the accounts of Rabanus and Hinemar but without explicitly noting their close resemblance, although he characterizes Rabanus's article as "mainly compiled."

clay), *pythii* or *pythonici*, *imaginarii* (who try to control spirits by use of images), *specularii* (who predict by looking into polished basins, glistening swords and mirrors), interpreters of dreams, chiromancers, *arioli*, *aruspices*, astrologers of various sorts, and so on.

We have already heard John speak of the evil deeds of the magicians. In a subsequent discussion in the second book of the *Polycraticus*,<sup>3</sup> where he treats more fully and perhaps with more originality the various species of magic, his attitude continues to be one of unvarying, though not always very vehement, condemnation. He occasionally makes criminal charges against magic, such as exposing children to vampires or cutting them up and devouring them,<sup>4</sup> and exclaims, "What shall I say of the necromancers. . . . except that those deserve death who try to obtain knowledge from death?"<sup>5</sup> He occasionally asserts that an occult art is irrational, as when he remarks that the error of chiromancy, "since it is not based on reason, need not be opposed with arguments,"<sup>6</sup> or when he sneers with Cicero and Augustine at divination from sneezes and "inane incantations and . . . superstitious ligatures,"<sup>7</sup> or when he affirms that the reputed nocturnal gatherings of witches are a delusion and that "what they suffer in spirit they most erroneously and wretchedly believe to happen in the flesh."<sup>8</sup> But his chief reason for condemning the magic arts is the traditional Christian view, as old as Origen and Augustine, that they are due entirely to the influence of demons.\* Scripture forbids them and God does not see fit to grant men such divining or transforming powers which he reserves for himself in signs and miracles. Indeed John's charges that magic is criminal and

<sup>3</sup> *Polycrat.*, Liber I, Prologus, and Caps. 1-23; Migne, 199: 415-475.

<sup>4</sup> *Polycrat.*, II, 17.

<sup>5</sup> *Ibid.*, II, 27.

<sup>6</sup> *Idem.*

<sup>7</sup> *Ibid.*, II, 1.

<sup>8</sup> *Ibid.*, II, 17. See too the Canon, *Ut episcopi* in Burchard's *Decreta*, Lib. X, Cap. 1.

\* See my article on "The Attitude of Origen and Augustine Toward Magic," in *The Monist*, January, 1908.

irrational are but corollaries of his main thesis. These arts must be evil if demons are behind them, while their incredible pretensions can be explained only by the hypothesis of demon aid.

Although John repeats a stale definition, he indicates that the magic arts are still alive. Many varieties of ancient divination he says are now defunct;<sup>9</sup> but books on oneiromancy are current.<sup>10</sup> A priest, who taught John psalms as a boy, used to dabble in magic,<sup>11</sup> and John even gently chides Thomas à Becket, then chancellor of England and to whom he dedicates his book, for having recently consulted both an aruspex and a chiromancer.<sup>12</sup> At the same time John is anxious to know what "those triflers" had to say, and it must be admitted that his condemnation of some varieties of divination is a bit perfunctory and that he dwells rather fondly upon omens from classical history and upon the interpretation of dreams.

#### HUGO OF SAINT VICTOR.

Hugo of Saint Victor, another clerical writer of the twelfth century, gives in his *Didascalicon* a brief description of magic which differs in form but agrees substantially with John's.<sup>13</sup> After the usual meagre historical account of its origin, in the course of which he twice identifies magic with *maleficia*, he says:

"Magic is not included in philosophy but is a distinct subject, false in its professions, mistress of all iniquity and malice, deceiving concerning the truth and truly doing

<sup>9</sup> *Ibid.*, II, 27.

<sup>10</sup> *Ibid.*, II, 17. Gratian seems to condemn the same book in his *Decretum*, Secunda pars, Causa XXVI, Quæst. vii. Cap. 16. Four such dream books by Daniel are to be found in the British museum, and all were printed before the close of the fifteenth century.

<sup>11</sup> *Polycrat.*, II, 28.

<sup>12</sup> *Ibid.*, II, 27; and see Ramsay, *Angevin Empire*, 119-120.

<sup>13</sup> Printed in Migne, Vol. 176 as "Eruditionis didascalicae libri septem," but Haureau rejects the seventh book (*Les Œuvres de Hugues de Saint-Victor*, Paris, 1886). Magic is discussed in Book VI, Ch. 15 (Migne, cols. 810-812).

harm; it seduces souls from divine religion, promotes the worship of demons, engenders corruption of morals, and impels its followers' minds to every crime and abomination."

He thus makes four points against magic: It is not a part of philosophy, in other words, it is unscientific; it is hostile to true religion; it is improper, immoral, and criminal; it is false and deceptive. These four points may be reduced to two: (1) since law, religion, and learning all condemn it, it is unsocial in every respect; and (2) it is more or less untrue and unreal. At the same time it is clear that to Hugo's mind magic is a broad field more or less coordinate with those of religion and philosophy. He subdivides it, as did John of Salisbury, into *praestigia*, *maleficia*, and *mathematica*, but also into *sortilegia* and *mantice*. These last two, however, refer, like *mathematica*, to arts of divination. *Sortilegia* is divination by lots; *mathematica* covers the activities of *aruspices*, augurs, and readers of horoscopes; while under *mantice* are included geomancy, hydromancy, aeromancy, pyromancy, and necromancy.

#### GUNDISSALINUS.

Gundissalinus, an archdeacon of Toledo who made translations from the Arabic about the middle of the twelfth century, in a classification which he borrows from Alfarabi, makes "nigromancy according to physics" the fourth of eight subdivisions of "natural science," instead of a department of magic; but admits that he as yet has no detailed acquaintance with it.<sup>14</sup> Yet he has given us a hint of the influence that the transmission of Arabian culture is likely to have upon the attitude toward magic in the Christian West, and in the succeeding century we note a considerable change.

<sup>14</sup> Gundissalinus, *De divisione philosophiae* (ed. by Ludwig Baur, Münster, 1903), pp. 20 and 38.



## THOMAS AQUINAS.

In the thirteenth century Thomas Aquinas, who makes a number of allusions to magic in the course of his works,<sup>15</sup> adheres to the essential features of the theological definition, condemning magic as evil and as the work of demons.<sup>16</sup> In the case of the three *magi* of the Gospel story, however, he explains that, while in common speech *magi* are called enchanterers (*incantatores*), in the Persian language the word designates philosophers and sages.<sup>17</sup>

Aquinas carefully distinguishes magic from miracle.<sup>18</sup> A miracle is contrary to the order of all created nature and can be performed by God alone. Many things that seem to us marvelous or occult are not, strictly speaking, miraculous. Such are the occult virtues of physical bodies "for which a reason cannot be assigned by man."<sup>19</sup> Such are the marvels worked in our lower world by the influence of the consellations. Even more exceeding human comprehension are the doings of demons, who, Aquinas is convinced, can not only deceive the senses and affect the human imagination but also truly transform bodies. Yet even their feats are not true miracles in violation of natural order; they simply add to the marvelous virtues of physical objects and the potent influences of the stars something of their own peculiar powers. After all, their feats can be explained; they operate by means of art; God alone is a cause absolutely hidden from every man.

As for magicians, in their feats they make use of herbs and other physical bodies; of words, usually in the form of "invocations, supplications, and adjurations"; they also

<sup>15</sup> I have used the complete edition of Aquinas's works in 34 volumes, edited by Fretté and P. Maré, Paris, 1871-1880.

<sup>16</sup> *De potentia*, VI, 10; *Contra Gentiles*, III, 104-106; *Quodlibet*, IV, 16. Aquinas makes considerable use of Porphyry's *Letter to Anebo*.

<sup>17</sup> Commentary on Matthew, Cap. 2.

<sup>18</sup> *Summa*, Prima pars, Quaest. 110, Art. 4 and Quaest. 111, Art. 3; *Contra Gentiles*, III, 101-103; *De potentia*, VI, 5; *Sententiae*, II, Dist. 7, Quaest. 2-3.

<sup>19</sup> *Summa*, Secundae secunda, Quaest. 96, Art. 2.

employ figures and characters, sacrifices and prostrations, images and rites, carefully observed times, constellations, and other astrological considerations.<sup>20</sup> As a result hidden treasure is found, the future is revealed, closed doors open, men become invisible, inanimate bodies move and speak, apparitions of rational beings are summoned and answer questions. In such feats of magic Thomas firmly believes, but he will not admit that the magician and his materials and procedure are a sufficient cause. Demons really perform the magic. Words, figures, spells are mere signs to them; the poor magician is their dupe. It looks, Thomas admits, as if spirits came only when invoked, and as if they often came unwillingly, and sometimes performed at the magician's bidding good deeds which must be very distasteful to them as evil beings. But in all this they are simply deceiving mankind. "It is not true then that the magic arts are sciences, but rather that they are certain fallacies of the demons."<sup>21</sup>

Aquinas further charges that the practitioners of magic are generally criminals, perpetrating illicit deeds, adulteries, thefts, and homicides; and that at best magic does not aid man in science or virtue but in trivial matters like the discovery of stolen goods. In discussing the "motory art," which professes to acquire knowledge by fasting, prayers to God, figures, and strange words, he declares that demons cannot illuminate the intellect, although they may express in words some smattering of the sciences.<sup>22</sup>

But in thus denying that the magic arts are sciences, Aquinas indicates that many thought them so, and that magicians believed themselves able by personal endowments, by subtle use of occult natural properties, by rites and ceremonies, and by the art of astrology, either to

<sup>20</sup> *Contra Gentiles*, III, 101-105; *De potentia*, VI, 10; *Summa*, Prima pars, Quaest. 115, Art. 5.

<sup>21</sup> *Quodlibet*, IV, 16.

<sup>22</sup> *Summa*, Secundae secunda, Quaest. 96, Art. 1.

work wonders directly and immediately or to coerce demons to work wonders for them. He thus gives us a glimpse of a different conception of magic from the old theological one.

Moreover, his own conception is scarcely that of John and Hugo. For one thing, he does not explicitly subordinate as many arts to magic as they do. Superstition is perhaps more in favor with him as a generic term than magic. He defines superstition as "a vice opposed to religion by its excess, not that it does more toward a divine cult than true religion, but that it introduces a divine cult either to what it ought not or in a way that it ought not."<sup>23</sup> But the chief difference between Aquinas and John and Hugo is that Aquinas justifies as scientific and moral matters which they classed under magic, and which would to-day be regarded as unscientific. He discusses the casting of lots, various forms of divination, "the occult works of nature," and the art of astrology in a manner not entirely hostile to their respective pretensions.<sup>24</sup> Thus while still holding that most arts of divination are the work of evil spirits, he believes that some kinds of divination have a natural basis and are not magic. He believes that bodies can be transformed by the occult virtues of natural things as well as by demons in magic. He recognizes much of astrology as a science, not as magic, although rejecting the extreme pretensions of astrologers. But into his interesting opinions on such points we have no time to go further here.

#### ALBERTUS MAGNUS.

Albertus Magnus was a contemporary of Aquinas and, like him, a great theologian and commentator upon Aris-

<sup>23</sup> *Ibid.*, Quaest. 92.

<sup>24</sup> *Summa*, Secundae secunda, Quaest. 95, Arts. 5-7; and the two brief treatises, *De sortibus* and *De occultis operibus, naturae*. His opinions concerning astrology are scattered through a dozen works.

totle. In his *Summa* and *Sententiae*, both theological works,<sup>25</sup> Albert, like Aquinas, more or less adheres to the traditional Christian attitude toward magic. He affirms that to employ "magic virtues" is evil and apostasy from the faith, whether one openly resorts to "invocations, conjurations, sacrifices, suffumigations, and adorations" or to some simpler and apparently innocent operation which none the less requires demon aid for its performance. Even of "mathematical virtues" (i. e., of astrological forces) one must beware, especially "in images, rings, mirrors, and characters," lest the practice of idolatry be introduced. Like Aquinas, he believes in the potency of magic. Though in one phase of magic, *praestigia* or illusions, things are made to appear to exist which have no reality, magic can also actually transform objects.

Again, like Aquinas, Albert insists that the feats of magic do not compare with miracles. They do not even happen as instantaneously, although they occur much more rapidly than the ordinary processes of nature. But except for this difference in speed they can usually be explained as the product of natural forces, and by the fact that demons are aided in their operations by the influence of the stars. To change rods into snakes, for instance, as Pharaoh's magicians did, is merely hastening the process by which worms generate in putrefying trees. Indeed, Albert is inclined to believe that the demons "produce no permanent substantial form that would not easily be produced by putrefaction." Even the magic power of fascinating human beings is, after all, only analogous to that of the sapphire to cure ulcers and of the emerald to restrain sexual passion. Thus even in his theological writings Albert attributes magic more to natural forces and to the stars, and less to demons than Aquinas did, or perhaps

<sup>25</sup> *Summa*, Secunda pars, Quaest. 30; *Sententiae*, II, Dist. 7 (Albertus Magnus, *Opera omnia*, ed. Borgnet, Paris, 1890-1899, 38 vols.)

we should say that he more closely connects the demons with forces of nature.

Moreover, a much more favorable opinion of magic may be found in Albert's biblical commentaries in his explanation of the *magi* who came to Bethlehem. Now he asserts that "the *magi* are not *malefici* as some wrongly think," and that they also differ from *mathematici*, enchanters, necromancers, *arioli*, *aruspices*, and diviners. Etymologically the *magus* is a great man (*magnus*), "who, having knowledge of all necessities and inferring from the effects of nature, sometimes predicts and produces the marvels of nature. . . . And this is laudable."<sup>26</sup> Again in his commentary on Daniel he quotes Jerome's description of the *magi* as "masters who philosophize about the universe; moreover, *magi* are more particularly called astronomers who search the future in the stars."<sup>27</sup> Thus we have magic almost identified with astrology and with natural science, and distinguished from a number of occult arts which the traditional definition identified with it.

In Albert's scientific writings we find yet a third conception of magic suggested by a number of scattered passages in which he refers to magic as if it were a distinct and definite branch of knowledge in his day, of which, though he himself does not treat, he does not seem to disapprove. In one place he refers to writings by Avicenna on magic and alchemy;<sup>28</sup> in other passages he mentions magic together with astronomy and necromancy. The "prodigious and marvelous" power of stones and of images and seals in stones, he twice assures us, cannot be really understood without a knowledge of "these three sciences."<sup>29</sup> He therefore will not discuss the subject in a treatise on minerals as fully as he might, "since those

<sup>26</sup> In Evang. Matth., II, 1. It is interesting to note that to-day the *Catholic Encyclopedia* still insists concerning the three wise men, "Neither were they magicians: the good meaning of *μάγοι* though found nowhere else in the Bible is demanded by the context of the second chapter of St. Matthew."

<sup>27</sup> I, 20.

<sup>28</sup> Borgnet, *Opera*, Vol. V, p. 26.

<sup>29</sup> *Ibid.*, pp. 48 and 55.

powers cannot be proved by physical laws (*principiis physicis*), but require a knowledge of astronomy and magic and the necromantic sciences, which would be considered in other treatises. Albert's friends (*socii*), however, are curious to know the doctrine of images even if it is necromancy, and Albert does not hesitate to assure them that it is a good doctrine in any case. Yet in his theological works he declared the art of images evil "because it inclines to idolatry. . . . and. . . . is employed for idle or evil ends."

Albert also counts the interpretation of dreams among "magical sciences" and speaks of the interpreters as wise men (*sapientes*).<sup>30</sup> Visions, however, which occur "when one is awake. . . . but the senses diverted. . . . are most employed by magicians, who indeed make a specialty of such diversions of the senses and such apparitions and of certain potions which close and stupefy the senses, and through the apparitions then made they conjecture the future."<sup>31</sup> In one passage Albert remarks that whether fascination is a fact or not is for magic to determine; in another place he classifies fascination as a department of magic.<sup>32</sup> In his treatise on the vegetable kingdom he declares that the consideration of "the divine effects" of certain plants is the especial concern of those interested in magic, and he also mentions "those who practise incantations" and necromancers as employing herbs for their marvelous properties.<sup>33</sup> In his treatise on animals he says that enchanters value highly the brain, tongue, and heart of the bird hoopoe, and adds, "We shall not consider this matter at this time, for the investigation of it belongs to another science,"—presumably magic.<sup>34</sup> On the other hand, in his work on minerals, although he quotes Socrates as having said that an incantation may be performed by suspending or

<sup>30</sup> *De somno et vigilia*, III, i, 10.   <sup>31</sup> *Ibid.*, III, i, 3.

<sup>32</sup> *Ibid.*, III, i, 6; and Borgnet, *Opera*, V, 24.

<sup>33</sup> *De vegetabilibus*, V, ii, 3 and 6.

<sup>34</sup> *De animalibus*, XXIII, 111.

attaching objects as well as by prayers, adjurations, characters, and images, he proceeds to discuss suspensions and ligatures, especially the wonderful effects produced by wearing certain gems suspended from the neck, on the ground that they operate more naturally, and more properly belong to physical science than to magic.<sup>35</sup> In another treatise, mentioning "astronomers, augurs, magicians, interpreters of dreams and of visions, and every such diviner," he admits that almost all men of this class delight in deception and have little education, but he insists that "the defect is not in the science but in those who abuse it."<sup>36</sup>

These brief allusions to magic indicate that Albert regards it as distinct from the natural sciences except "astronomy," with which he connects it rather closely, but astronomy of course for Albert includes astrology and is a science of superior bodies and stands above the sciences of inferior creation. He says that it is a fundamental principle in the science of the *magi* that all things made by art or nature are moved by celestial virtues.<sup>37</sup> But of demons in connection with magic he says nothing in his scientific writings.

In the *Speculum astronomiae* ("Mirror of Astronomy")<sup>38</sup> which also seems to be from Albert's pen, a different attitude appears. Instead of nonchalantly correlating magic, astronomy, and necromancy, as was done in the treatise on minerals, the author says nothing of magic and is concerned to distinguish between "astronomy" and necromancy, and in particular between astrological and necromantic images. His aim now is, while admitting the harmful character of necromancy as dealing with demons

<sup>35</sup> *Mineral.*, II, iii, 6. <sup>36</sup> *De somno et vigilia*, III, ii, 5. <sup>37</sup> *Mineral.*, II, iii, 3.

<sup>38</sup> Contained in volume X of Borgnet's edition. Franz Cumont (*Catalogus codicum astrologorum Graecorum*, V, i, 85) says that Borgnet's text of the *Speculum* is full of errors, and gives a partial new version from manuscripts. Mandonnet, "Roger Bacon et le 'Speculum astronomiae,'" *Revue Neo-Scholastique*, Vol. XVII (1900), argues that Bacon was the author, but his argument is based in large measure on false premises.

and contrary to the Catholic faith, to defend astrology from any such imputations, and to draw up separate lists of books which are bad and necromantic and of those which are "astronomical" and of value. Some of the books now condemned as necromantic are, however, the very ones which in the treatise on minerals<sup>39</sup> Albert cited concerning the science of the *magi* and which in his theological *Summa*<sup>40</sup> he cited as authorities on necromancy. It therefore becomes evident that the *Speculum astronomiae* is a piece of special pleading, written in reply to a contemporary attack upon necromantic and astrological literature. In fact the author cannot restrain himself from advising that the necromantic books be preserved rather than destroyed.

Albert spoke in his scientific writings as if he might sometime write some separate treatises on magic. Two little works have come down to us which somewhat answer that description. They have been regarded as spurious, but were certainly influential, since there seem to be about as many printed editions of them alone as of all Albert's other numerous works. Their titles are *Liber aggregationis, or The Secrets of the Virtues of Herbs, Stones and Animals*, and *The Wonders of the World (De mirabilibus mundi)*.<sup>41</sup> The former seems to be professedly a book of magic since it opens with the assertion that "magical science is not evil, since through knowledge of it evil can be avoided and good attained." The author then plunges at once into the subject of the occult virtues of herbs, stones, and animals. By these, combined with varied ceremonies and due observance of astrological considerations, such marvels can be worked as to alter the attitude of others toward oneself, reveal hidden crimes, deprive men

<sup>39</sup> II, iii, 3.

<sup>40</sup> II, ii, 30.

<sup>41</sup> I have used an edition printed in Amsterdam in 1740 in which these two treatises are bound together with the *De secretis mulierum*, and with the *Physiognomy* of Michael Scot, mentioned below in note 46.



of sleep or force confidences from them when asleep, quiet barking dogs or make cows dry, free prisoners, become invisible, acquire knowledge or a good intellect, tell if one's wife be true, incite sadness or joy or love, freeze boiling water, produce an inextinguishable fire, make the sun bloody or a rainbow to appear, feel no pain under painful circumstances, drink to excess and not get drunk, conquer enemies, escape perils, overcome wild beasts, interpret all sorts of dreams, read others' thoughts, and predict the future. As in Albert's allusions to magic in his scientific writings, so here nothing is said of employing demons to produce these results, and so marvelousness rather than employment of spirits appears as the chief feature of magic.

In the *De mirabilibus mundi* "marvels" rather than "magic" are the theme, but the author has read "the books of necromancy and the books of images and magic books,"<sup>42</sup> and most of the marvels which he instructs how to produce would probably be pretty generally regarded as magic by his contemporaries. Such are to make men seem headless or with the heads of animals or three heads or the face of a dog, or to make men appear in any form even as angels, or to make the entire house seem full of serpents or elephants. The author regards the human soul and its desires as the greatest force in effecting marvels, though he also recognizes the potency of occult virtues in natural objects, of heat and cold, of the influences of the stars, of procedure fitting the end sought, of suffumigations, and of demons.<sup>43</sup> Little, however, is said of demons except in connection with "the science of necromancy in which are manifested the immaterial substances which direct and assist man."<sup>44</sup> Despite his faith in marvels the author recognizes that "it is the wise man's task to make marvels cease" by adequate explanation of them.<sup>45</sup>

\* P. 159.

\* Pp. 158, 166, 170.

\* Pp. 168-169.

\* P. 158.

## MICHAEL SCOT.

We come next to writings which emphasize more the participation of demons in magic and which illustrate in detail the relations between magic, "astronomy," and necromancy which Albertus Magnus suggested. These writings are as follows: (1) An elaborate treatise of the early thirteenth century on astrology, astronomy, and various related fields such as music and geography, dedicated to his patron the emperor Frederick II by Michael Scot,<sup>46</sup> who was no mere court astrologer but the introducer to medieval Christendom of many of the works of Aristotle and a translator of other writings from the Arabic; (2) A commentary of the early fourteenth century upon that brief but standard medieval astronomical treatise, *The Sphere* of Sacrobosco, by Cecco d'Ascoli,<sup>47</sup> who after being professor of astrology at the university of Bologna and court astrologer to the duke of Florence was condemned to the stake by the Inquisition in 1327; (3) A book of magic called *Picatrix*,<sup>48</sup> translated from Arabic into Spanish by order of the learned Alphonse X of Castile who reigned 1252-1284 and who is notable for his astronomical tables and mild law concerning magic.<sup>49</sup>

Michael Scot combines traces of the patristic definition

<sup>46</sup> Scot's work divides into four parts; a general preface, a *Liber introductorius*, a *Liber particularis*, and a *Liber physionomiae*. Of these the first two exist in the Bodleian MS. 266 (saec. XV, 218 fols., long double columns, text greatly abbreviated, and in many different hands illustrated); and at Munich, Staatsbibliothek, Cod. Lat. 10268 (saec. XIV, 146 fols.). The *Liber particularis* is found only at the Bodleian in MS. Canon Misc. 555, where it occupies fols. 1-59, and the *Liber physionomiae*, fols. 59-88. The last, however, has been separately printed. (See note 41.)

<sup>47</sup> I used two editions of 1499 and 1518 at the British Museum.

<sup>48</sup> The work is extant in Latin translations in MSS. XX, 20, and XX, 21 of the National Library at Florence. Both manuscripts have the same colophon, dated in 1536 and the pontificate of Paul III, but their contents are not always identical although they roughly correspond. Symphorien Champier, writing in 1514, refers to *Picatrix* in his edition of the *Conciliator* of Peter of Abano.

<sup>49</sup> *Los Codigos Españoles concordados y anotados: Código de las siete partidas*, 2d ed., Madrid, 1872, Vol. IV. La setena partida: Título XXIII: Ley 1-3. Divination of the future by the stars is sanctioned in the case of persons properly trained in astronomy, although other varieties of divination

of magic with the attitude of an astrologer and with citations from Arabian sources and from books of necromancy and of the notory art. Thus he condemns magic and necromancy, but lists as "arts which are in a certain measure palliated under the name of astronomy," geomancy, hydromancy, aeromancy, pyromancy, nigromancy, augury, physiognomy, praestigiomancy, the notory art, lot-casting, and alchemy.<sup>50</sup> He represents magicians as acquainted with secrets of nature and as employing herbs as well as characters and incantations.<sup>51</sup> He states that alchemists, nigromancers, and workers in the notory art owe more to astrology than they admit,<sup>52</sup> and informs us that by astronomical images very wise demons can be conjured to give responses.<sup>53</sup> He also mentions "the virtues who rule the circles of the planets," "the legion of damned spirits" who exist in the winds,<sup>54</sup> and the evil spirits in the moon who are wise in all sciences and may be invoked by conjurations.<sup>55</sup> He states that since demons are by nature fond of blood, and especially of human blood, nigromancers or magicians in performing their experiments often mix water with real blood or use wine that has been been exorcised to make it bloody, "and they sacrifice with flesh of a living human being, such as a bit of their own flesh or of a corpse, and not with the flesh of brutes, knowing that the consecration of a spirit in a ring or a bottle cannot be achieved except by the performance of many sacrifices."<sup>56</sup> Scot also lists the names by which spirits may be invoked.<sup>57</sup> Thus he shows more interest in necromancy than is consistent with his formal condemnation of it and magic.

are forbidden; and while those who conjure evil spirits or who make waxen, metallic or other images with the aim to harm their fellows are to be punished by death, those who employ incantations with good intentions and good results are pronounced deserving of reward rather than penalty.

<sup>50</sup> Bodleian MS, 266, fol. 22.

<sup>51</sup> *Ibid.*, fol. 23.

<sup>52</sup> *Ibid.*, fols. 2 and 20.

<sup>53</sup> *Ibid.*, fol. 21.

<sup>54</sup> *Ibid.*, fols. 28-29.

<sup>55</sup> Canon misc., fol. 17.

<sup>56</sup> Bodl. MS. 266, fol. 22.

<sup>57</sup> *Ibid.*, fol. 172.

## CECCO D'ASCOLI.

The attitude of Cecco d'Ascoli is very similar.<sup>58</sup> He gives a classification of the magic arts almost identical with that by Hugo of St. Victor, but states that he derives it from the *Liber de vinculo spiritus* of Hipparchus. He of course does not regard astrology as a part of magic, and declares that while one can learn something of the future through magic, the science of the stars is "a more excellent way." Magic is, he says, "emphatically censured by holy mother church."<sup>59</sup> This fact, however, does not restrain him from frequently citing magic books such as Apollonius's *Liber artis magicae*, nor from telling his students—his commentary is evidently a set of classroom lectures—all the necromancy that he happens to know. Thus when Sacrobosco describes the *coluri*, or circles whose function is to distinguish the solstice and equinox, Cecco comments that Hipparchus in the *Liber de hierarchiis spirituum* tells of incubi and succubi who inhabit these circles and by whose virtue in a greater conjunction divine men are born such as Merlin was and Antichrist will be.<sup>60</sup> When Sacrobosco mentions the four cardinal points, Cecco is reminded of Hipparchus's statement in the *Liber de ordine intelligentiarum* that certain princes of the demons "hold the four parts beneath the sky. For expelled from heaven they occupy the air and the four elements."<sup>61</sup> When Sacrobosco speaks of the zenith or poles in a purely astronomical way, Cecco quotes Hipparchus again as saying, "O wonderful zenith and godlike nature, etc.," after the manner of an invocation, or Solomon in the *Liber de umbris idearum* as exclaiming, "O arctic manes, O antarctics

<sup>58</sup> The following references to Cecco's Commentary apply to the edition of 1518 in which it occupies the first 23 leaves of a collection of commentaries upon Sacrobosco and of other astronomical treatises.

<sup>59</sup> Fol. 3: *a sancta matre ecclesia vituperabiliter improbata.*

<sup>60</sup> Fol. 14.

<sup>61</sup> Fol. 15.

propelled by divinity."<sup>62</sup> When Sacrobosco treats of climates, Cecco remarks that the word may be understood in two ways, astronomically or necromantically. It is in the latter sense that Zoroaster, "the first inventor of the magic art," uses the word when he says, "For those climates are to be marveled at, which with flesh of corpses and human blood give responses the more trustworthily." "By this," continues Cecco, "you should understand those four spirits of great virtue who stand *in cruciatis locis*, that is, in east, west, north and south, whose names are these, Oriens, Amaymon, Paymon and Egim, spirits who are of the major hierarchy and who have under them twenty-five legions of spirits apiece. Therefore because of their noble nature these seek sacrifice from human blood and from the flesh likewise of a dead man or cat. But this Zoroastrian art cannot be carried on without great peril, fastings, prayers, and all things which are contrary to our faith."<sup>63</sup>

Such a belated and somewhat perfunctory warning that these things are contrary to the Christian religion is characteristic of Cecco. Elsewhere he calls these spirits demons and diabolical<sup>64</sup> and states with Augustine that "spirits who are outside the order of grace" cannot truly transmute bodies nor raise the dead, nor do any marvels and feats of magic except those which can be accounted for by the occult virtues of nature.<sup>65</sup> He also asserts that a "Floron," mentioned by Salomon in the *Liber de umbris idearum*, was of the hierarchy of cherubim and was confined in a mirror by a major invocation, and that this Floron knew many secrets of nature and deceived King Manfred and others by ambiguous oracles. "So beware of these demons because their ultimate intention is to deceive Christians to the discredit of our Lord Jesus Christ."<sup>66</sup>

<sup>62</sup> Fols. 20 and 17.

<sup>63</sup> Fol. 16.

<sup>64</sup> Fol. 21.

<sup>65</sup> Fol. 17.

<sup>66</sup> Fols. 17 and 22.

Yet on the next page we find Cecco saying that if any one wishes to make an image in order to obtain responses from a spirit, he ought to observe the instructions which follow; while five pages later he cites a response of this same Floron as to the time when demons are least liable to deceive one and when as a consequence it is best to consult them. In short Cecco's work is less a commentary on Sacrobosco's *Sphere* than a manual of astrological necromancy.

#### PICATRIX.

*Picatrix* is a confused compilation of extracts from occult writings and a hodgepodge of innumerable magical and astrological recipes. The author states that he "has compiled this book," that he intends to set forth "in simple language" what past sages have concealed in cryptic words, and that he has spent some six years in reading 224 books by "ancient sages."<sup>67</sup> Whenever modern compilers of the notions of folklore and the magical customs of aborigines shall have exhausted their resources, a rich mine will still await them in this book of magic.

For *Picatrix* is openly and professedly a book of magic. At the close of the first of its four books we are told that its contents are "the roots of the magic art" and that "without them one cannot become perfect in such arts."<sup>68</sup> Throughout all four books "magic works," "magic effects," "magical sciences," and "the operator of magic" are mentioned, and books of magic by Abrarem (Abraham?), Geber, and Plato are cited.<sup>69</sup> It is true that the term necromancy is also employed frequently and a chapter devoted to its definition,<sup>70</sup> and that astrological images and

<sup>67</sup> MS. XX, 20, fols. 1 *verso* and 53 *recto*.

<sup>68</sup> *Ibid.*, 15*v*.

<sup>69</sup> *Ibid.*, 7*v*., 44*r*., 44*v*., 22*v*., 23*r*., 28*r*., 40*r*., 50*r*., 51*r*., 99*r*.; MS. XX, 21, fols. 78*r*. and 79*v*.

<sup>70</sup> Liber I, Cap. 2. This chapter is much briefer in MS. XX, 21 than in MS. XX, 20.

invocations of demons are the subjects most discussed. But it is said on the supposed authority of Aristotle that the first man to work with such images and to whom spirits appeared was Caraphrebim, the inventor of the magic art.<sup>71</sup> It is also affirmed that the science of the stars is the root of magic, that the forms of planets or astronomical images "have power and marvelous effects in magic operations," while after announcing his intention of listing "the secrets of the ancient sages in the magic art" the first thing that our author divulges is that the influence of Saturn exceeds the influence of the moon.<sup>72</sup>

On the whole then, while magic is not defined at length in *Picatrix*, it seems justifiable to apply it as a general term covering the contents of the book and to regard astronomical images and invocations of demons as two of magic's leading characteristics. *Picatrix* regards magic as a science, as a superior branch of learning, to excel in which many other studies must first be mastered; and he believes that the greatest philosophers of antiquity, like Plato and Aristotle, have written works of magic.

Much use of natural objects is made in the various recipes of *Picatrix*. Here is one brief instance: Adam the prophet says that if you take 14 grains of the fruit of the laurel tree, dry them well and pulverize them and put the powder in a very clean dish in vinegar, and beat it with a twig from a fig tree, you can make any one you wish possessed of demons by giving him this powder to drink.<sup>73</sup> One chapter is especially devoted to "the virtues of certain substances produced from their own peculiar natures," and the author further explains that "in this section we shall state the marvelous properties of simple things as well of trees as of animals and of minerals."<sup>74</sup> In actual procedure, however, the use of several things combined is

<sup>71</sup> MS. XX, 20; fol. 55v. <sup>72</sup> *Ibid.*, 32v. and 28r. <sup>73</sup> MS. XX, 21, fol. 79v.

<sup>74</sup> Lib. IV, Cap. 8. MS. XX, 20, fol. 108v; MS. XX, 21, fol. 86r.

usually recommended, as a suffumigation of 14 dead bats and 24 mice, to give a comparatively simple example.<sup>75</sup>

On the supposed authority of Aristotle in a book written to Alexander, detailed instructions are given how to make four "stones" of great virtue and of elaborate composition by procedure more or less alchemistic.<sup>76</sup> Indeed, there are listed all sorts of "confections," compounds, and messes, either, to burn or sacrifice or eat or drink or smell of or anoint oneself with, in order to bring various wonders to pass. The ingredients employed include different oils and drugs, butter, honey, wine, sugar, incense, aloes, pepper, mandragora, twigs, branches, adamant, lead, sulphur, gold, the brains of a hare, the blood of a wolf, the urine of an ass, the filth of a leopard, and various portions of such animals as apes, cats, bears and pigs.

Hermes is quoted as saying that there are many marvels for necromancy in the human body,<sup>77</sup> various parts of which are often employed. Thus in making a magic mirror one is bidden to employ a suffumigation of seven products of the human body, namely, tears, blood, ear-wax, spittle, *sperma*, *stercus*, *urina*.<sup>78</sup> Vile and obscene substances seem in great demand for purposes of magic throughout the book. Besides ingredients, all sorts of receptacles and material paraphernalia are listed: vessels, jars, vases, braziers, crosses, candles, crowns, etc. *Picatrix*, like the *De Mirabilibus*, considers heat an important force in magic and mentions both elemental and natural heat, the former referring to the use of the element fire in sacrifice, suffumigation and the preparation of magic compounds, the latter designating the heat of digestion when recipes must be eaten to take effect.<sup>79</sup>

Much is said of the magician himself as well as of the materials which he employs. He should have faith in his

<sup>75</sup> MS. XX, 20, fol. 70r.

<sup>76</sup> Lib. III, Cap. 10. MS. XX, 20, fol. 73v. MS. XX, 21, fol. 53r.

<sup>77</sup> MS. XX, 21, fol. 60v.

<sup>78</sup> *Ibid.*, 22v.

<sup>79</sup> Lib. I, Cap. 2.



procedure, put himself into an expectant and receptive mood, be diligent and solicitous.<sup>80</sup> Often chastity is requisite, sometimes fasting or dieting, sometimes the wearing of certain garments.<sup>81</sup> He must have studied a long list of other sciences before he can attempt necromancy, but then to succeed in magic he must drop all other studies and devote himself to it exclusively.<sup>82</sup> A little knowledge of necromancy is a dangerous thing, and the ignorant meddler therein is liable to be violently slain by indignant demons.<sup>83</sup> Much depends also upon the magician's personality and natural fitness. No one can succeed in the science of images unless his own nature is inclined thereto by the stars. Some men are more subtle and spiritual, less gross and corporeal than others, and hence more successful in magic.<sup>84</sup> The ancients, when they wished to employ a boy in magic, used to test his fitness by fire as well as to make sure that he was physically sound.<sup>85</sup>

It has already been implied that great stress is laid upon procedure. Images of persons or things concerned are extensively employed. Thus to catch fish one makes an image of a fish, and to bewitch a girl one makes a waxen image of her and dresses it in clothes like hers. In both cases, however, there is additional ceremony to be observed. The head of a fish should be fashioned first; the image is to be poised on a slender rod of silver, and this is to stand erect in a vessel which is to be filled with water, sealed tightly with wax, and dropped to the bottom of the stream where one is to fish.<sup>86</sup> In the bewitching of the girl, which is told as an actual occurrence, the object was to make her come to a certain man. Hence another image was made of him out of a pulverized stone mixed with gum, and the two images were placed facing each other in a vase where seven twigs of certain trees had been ar-

<sup>80</sup> I, 4.<sup>81</sup> II, 12; III, 5 and 7 and 12, etc.<sup>82</sup> IV, 5.<sup>83</sup> MS. XX, 20, fol. 12r. and MS. XX, 21, fol. 75v.<sup>84</sup> Lib. III, 6 and IV, 1    <sup>85</sup> MS. XX, 21, fol. 47v.    <sup>86</sup> MS. XX, 20, fol. 10.

ranged crosswise. The vase was then buried under the hearth where there was a moderate fire and a piece of ice. When the ice had melted the vase was unearthed and the girl was immediately seen approaching the house. In the reverse process to free her from the spell a candle was lit on the hearth, the two images were taken out and rudely torn apart and an incantation uttered.<sup>87</sup>

To make a spring that is going dry flow more freely a small and comely virgin should walk up and down beating a drum for three hours, and then another small and good-looking girl should join in with a tambourine for six hours more. To ward off hail storms a company of people should go out in the fields, half of them tossing handfuls of silk toward the sky and the other half clapping their hands and shouting as rustics do to frighten away birds.<sup>88</sup> Tying seven knots and saying an incantation over each is another specimen of the ceremonial in *Picatrix*.

Ritual also plays an important part in the invocation of spirits. If one wishes to invoke the spirit called "Complete Nature" he must enter a spick and span room while the moon is in the first degree of Aries. Various receptacles filled with different foods and combustibles must be arranged in a certain way on a table. Then he must stand facing the east and invoke the spirit by its four names seven times and repeat a prescribed form of prayer for increase of knowledge and of moral strength.<sup>89</sup> To draw down the virtue and power of the moon one crowns oneself in the favorable astrological hour and goes to a green spot beside a stream. There he beheads with a bone—under no circumstances employing iron—a cock with a divided crest. He stands between two braziers filled with live coals on which he casts grains of incense gradually until smoke arises; then, looking toward the moon, he should say, "O

<sup>87</sup> *Ibid.*, fol. 52.

<sup>88</sup> *Ibid.*, 103v.; MS. XX, 21, fols. 81v., 82r.

<sup>89</sup> III, 6. MS. XX, 20, fols. 54-55; MS. XX, fols. 21, 32-34.

moon, luminous and honored and beautiful, thou who shatterest darkness by thy light, rising in the east and filling the whole horizon with thy light and beauty, I come to thee humbly asking a boon." Having stated his wish, he withdraws ten paces, facing the moon the while and repeating the above formula. Then more incense is burned and a sacrifice performed and characters inscribed on a leaf with the ashes of the sacrifice and a bit of saffron. This leaf is then burned and as its smoke rises the form of a well-dressed man will appear, who will answer the petition.<sup>90</sup>

Throughout *Picatrix* planets and spirits are closely associated. Many instructions are given how to pray to each of the planets and to work magic by their aid, just as if they were demons. It is hard to say whether the spirits are more thought of as forces in nature or the stars as gods. A necromancer who does not know astronomy is helpless, and each planet has a list of personal names associated not only with itself but with its every part and position.<sup>91</sup> Lists are also given of the boons which one may ask from each planet, and of the stones, metals, animals, trees, colors, tinctures, odors, places, suffumigations, and sacrifices appropriate to each planet and sign of the zodiac, in order that one may use the proper materials, eat the right food, and wear the right clothes when petitioning any one of them.<sup>92</sup> Let us remember, too, that the natural qualifications of the magician depend upon his horoscope.

Finally *Picatrix* devotes much space to astronomical images,<sup>93</sup> which, engraved preferably upon gems in accordance with the aspect of the sky at some instant when the constellations are especially favorable, are supposed to receive the celestial influences at their maximum and store them up for future use. That they receive "the force of

<sup>90</sup> IV, 2. MS. XX, 21, fol. 68v.

<sup>91</sup> III, 9. MS. XX, 20, fol. 71r. MS. XX, 21, fol. 50r.

<sup>92</sup> II, 5 and 10; III, 1 and 2.

<sup>93</sup> Liber II, *passim*: also I, 4-5 and IV, 9.

the planets" and do marvelous works, such as the invocation of demons, is, *Picatrix* believes, "proved by nature and by experiment." He lists them for 48 figures made from the fixed stars, for the 28 mansions of the moon, for the signs of the zodiac and the planets. As an example may be given one of the images for Saturn: "A man erect on a dragon holding a sickle in his right hand and a spear in his left hand, and clad in black clothing and a panther skin." This image "has power and marvelous effects in magic works."<sup>94</sup> Characters made up of lines and geometrical figures are also derived from the consellations and are supposed to possess marvelous efficacy.

Some of the results attributed to images and characters are to drive away mice, free captives, throw an army into a town, render buildings safe and stable or impede their erection, acquire wealth for oneself or one's friends, make two persons fall in love, make men loyal to their lord, make the king angry with some one, cure a scorpion's sting, walk on water, assume any animal form, cause rain in dry weather and prevent rain in wet weather, make the stars fall or sun and moon appear to be divided into many parts, ascend into the air and take the form of a falling star, speak with the dead, destroy a city or enemy, traverse great distances in the twinkling of an eye. Similar are the aims of incantations, invocations, and recipes, as has already been indicated in several cases. Ten "confections" are listed that stop evil tongues; eight, that generate discord and enmity; six, that taken in food cure impotency; seven, that induce a sleep like unto death; ten, that induce a sleep from which one never wakes.<sup>95</sup> Others prevent dogs from barking at you, produce green tarantulas or red serpents, remove bothersome frogs from pools, cause water to burn and appear red, enable one to see small objects a

<sup>94</sup> II, 10. MS. XX, 20, fol. 32v. MS. XX, 21, fol. 14v.

<sup>95</sup> III, 11. MS. XX, 20, fol. 78v. MS. XX, 21, fol. 58v.

long way off, make the winds and tempests obey you, deprive of memory or sense or speech or sight or hearing, and so on through a long gamut. We note that the aims are now good, now evil, that they are infinitely varied, and that they are very much like the aims of the two works attributed to Albertus Magnus where so little use of demons was made.

## THABIT BEN CORRA.

Astronomical images are again associated with magic in a little treatise of fourteen pages by Thabit ben Corra ben Zahrun el Harrani, whom Albertus Magnus, Peter of Abano, Cecco d'Ascoli, and *Picatrix* all cite as an authority on images,<sup>96</sup> and whom Roger Bacon styles "supreme philosopher among all Christians."<sup>97</sup> Hence, although he was born in Mesopotamia in 836 and lived for the most part at Bagdad until his death in 901, we may regard his conceptions as still influential in thirteenth century Europe. His treatise concludes: "And this is what the highest God wishes to show to his servants concerning magic, that his name may be honored and praised and ever exalted through the ages." In the printed edition of Frankfort, 1559, it is entitled *De tribus imaginibus magicis*.<sup>98</sup> Yet no mention is made of demons, and we are told that the material, be it lead or bronze or gold or wax, from which the image is made is unimportant, and that all depends upon the astronomical conditions at the time of construction. However, some sort of non-astronomical ceremony is usually added, such as burying the image, wrapping it in a clean cloth, writing upon it the names of the persons concerned and the end sought, and "naming the image by a

<sup>96</sup> *Mineral.*, II, iii, 3; *Spec. astron.*, Cap. XI; *Conciliator*, Diff. X, fol. 16, GH; *Sphera*, Cap. 3.

<sup>97</sup> Bridges, I, 394.

<sup>98</sup> A treatise entitled *Liber prestigiorum Thebidis (Elbidis) secundum Ptolemeum et Hermetem per Adhelardum bathoniensem translatus*, which occupies fols. 70-74 in MS. 328 at Lyons, is possibly the same work.

famous name"—which perhaps has reference to spirits. The objects sought are similar to those in *Picatrix*.

ROGER BACON.

From the picture of magic from the inside and by one favorably disposed toward it which *Picatrix* affords we turn to a last description by one of the most critical and scientific minds of the thirteenth century, Roger Bacon. He mentions magic a number of times in his *Opus maius* and *Opus tertium*, and also wrote a short treatise entitled, "On the Secret Works of Art and Nature and the Nullity of Magic."<sup>99</sup> He uses magic as a generic term and adopts the same fivefold division of it as Hugo and Cecco.<sup>100</sup> Toward it his point of view is that of the Christian man of science rather than of the theologian. He does not sound a religious retreat from magic but a scientific attack upon it. What impresses him most is not its irreligious nor criminal character, although he calls the magicians *maledicti*<sup>101</sup> and is careful to admit the possibility of demons participating in magic, but that magic is fraudulent and futile. He couples the words "false and magical,"<sup>102</sup> speaks of the "figments of the magicians,"<sup>103</sup> and associates magic, not like Albert with necromancy and astronomy, but with necromancy and deception.<sup>104</sup> For him magicians are neither *magni* nor philosophers and astronomers; in half a dozen passages he classes them with old wives and witches.<sup>105</sup>

He represents magic as using sleight-of-hand, ventriloquism, subtle mechanism, darkness, and confederates to simulate results which it is unable to perform.<sup>106</sup> Or by

<sup>99</sup> Roger Bacon, *Opus maius*, ed. J. H. Bridges, Oxford, 1897, 2 vols. and a third published in 1900. Roger Bacon, *Opera inedita* (including the *Opus tertium* and *De secretis*), ed. J. S. Brewer in Vol. XV of *Rerum Britannicarum mediæ ævi scriptores*, London, 1859.

<sup>100</sup> Bridges, I, 240.

<sup>101</sup> *Ibid.*, 395 and 399.

<sup>102</sup> Brewer, pp. 47, 95.

<sup>103</sup> *Ibid.*, 532.

<sup>104</sup> Bridges, I, 262.

<sup>105</sup> *Ibid.*, 395-6, 398, 399; Brewer, 46-7, 95, 98.

<sup>106</sup> Brewer, 523.

use of natural objects it idly flatters itself that it coerces spirits who in reality respond only with evil intent and as God permits. Thus the *mathematici* in particular not only wrongly ascribe fatal necessity to the stars and "invoke demons by conjurations and sacrifices to supplement the influence of the constellations," but they mar their observations of the sky by circles and figures and characters of the vainest sort and by very stupid incantations and senseless prayers in which they put their trust," and they often resort to "confederates, darkness, deceptive mechanisms, sleight-of-hand—methods in which they know there is allusion— and by those methods in which there is no virtue from the sky they perform many feats that seem marvels to the stupid."<sup>107</sup> As for incantations, "the human voice has not the power that magicians imagine"; and when magic words are spoken, "either the magician accomplishes nothing or the devil is the real author of the work."<sup>108</sup> Bacon dismisses the views of magicians concerning fascinations and transformations as "worthless," "stupid," and so on.<sup>109</sup>

But it is clear from Bacon's frequent references to magic that it is a delusion still very much alive. Indeed he expressly asserts not only that magic was prevalent in antiquity, though opposed by philosophy, and that magicians resisted the early church,<sup>110</sup> but also that "every nation is full" of the superstitions sown by demons, witches, and magicians.<sup>111</sup> "Books of the magicians," falsely attributed to Solomon and ancient philosophers and which "assume a grand-sounding style," are in circulation but are really "new inventions" and "ought all to be prohibited by law, since they abound in so many lies that one cannot distinguish the true from the false."<sup>112</sup>

<sup>107</sup> Bridges, I, 241.

<sup>108</sup> Brewer, 98; Bridges, I, 399.

<sup>111</sup> Bridges, I, 395.

<sup>108</sup> Brewer, 531, and 96.

<sup>110</sup> Brewer, 29; Bridges, I, 29 and 241.

<sup>112</sup> Brewer, 526 and 531.

Indeed, Bacon seems to think that magic has taken such a hold upon men that it can be uprooted only by scientific exposition of its tricks and by scientific achievement of even greater marvels than it professes to perform. Perhaps he realizes that religious censure or rationalistic argument is not enough to turn men from these alluring arts, but that science must show unto them yet a more excellent way, and afford scope for that laudable curiosity, that inventive and exploring instinct which magic pretends to gratify. He asserts concerning experimental science: "It alone instructs how to consider all the follies of the magicians, not to confirm them, but to shun them, just as logic deals with sophistry."<sup>113</sup> Bacon also contends that the wonders of nature and the possibilities of applied science far outshine the feats of magicians.<sup>114</sup> Science, in short, not merely attacks magic's front; it can turn its flank and cut it off from its base of supplies.

But Bacon's science is sometimes occult science. Some of his "secret works of art and nature" would be classified as magic by many of our authors. He really goes about as far as Albertus Magnus in credulous acceptance of superstition and marvels, but does not apply the term magic to what Albert admits is magic. Bacon has no intention of classifying as magic all astrology, or all use of incantations, characters, and fascination. He holds that there are two meanings of the word *mathematica*, which may be used to denote either a branch of magic or a part of philosophy, although some theologians ignorantly condemn both alike.<sup>115</sup>

Bacon also complains that the mass of students and professors and many authorities in theology and canon law call all images magical indiscriminately, and that as a consequence "scarcely any one has dared to speak in public"

<sup>113</sup> Bridges, II, 172.

<sup>114</sup> Brewer, 532-537.

<sup>115</sup> Bridges, I, 239 and 247; Brewer, 27.



of the marvels that can be wrought by use of astronomical images, "for such men are immediately called magicians although really they are very wise."<sup>116</sup> Similarly, although haphazard fascination is magic, Bacon holds that just as certain bodily diseases are contagious, so if some malignant soul thinks powerfully of infecting another and desires this ardently and is full of faith in its own power to injure, "there is no doubt that nature will obey thought, as Avicenna shows, . . . and this much is not magic."<sup>117</sup>

Bacon also does not doubt that the human voice "has great virtue, though not that power which magicians imagine"; and he declares that words are the most appropriate instrument of the soul, as is shown by the fact that almost every miracle from the beginning of the world has been performed by the use of words.<sup>118</sup> "For where the attention, desire, and virtue of the rational soul, which is worthier than the stars, concur with the power of the sky, either a word or some other work must be produced of marvelous power in altering the things of this world, so that not natural objects only but souls will be inclined as the wise operator wishes." Incantations of this sort, "brought forth by the exertion of the rational soul and receiving the virtue of the sky as they are uttered" are philosophical, not magical.<sup>119</sup>

Bacon wants books of magic destroyed, but he states that many writings are reputed to be magic which are nothing of the kind but contain sound learning.<sup>120</sup> He accuses magicians not merely of ascribing falsely various "enormities" to Solomon, but also of interpreting incorrectly and making evil use of "enigmatical writings" which he believes Solomon really did write.<sup>121</sup> After all this we are not surprised at his complaint that men are confusing

<sup>116</sup> Bridges, I, 394.

<sup>117</sup> *Ibid.*, 398.

<sup>118</sup> Brewer, 96 and 528-531; Bridges, I, 398.

<sup>119</sup> Bridges, I, 395.

<sup>120</sup> Brewer, 532.

<sup>121</sup> Bridges, I, 392.

science and philosophy with magic; and that contemporary theologians, Gratian, and "many saints" "have condemned many useful and splendid sciences along with magic."<sup>122</sup> Indeed we strongly suspect that Bacon has made up for himself such a definition of magic that he can condemn it and not be accused of it.

It would be unjustifiable to attempt a final definition of magic on the basis of data from so brief and late a period in its history as the one here considered. But our material seems to offer valuable suggestions toward such a definition. Varying in some respects as are the descriptions of magic which have been here summarized, they seem to be but different views of the same thing. Magic appears on the whole as a great primary division of human thought and activity. Other subjects are subordinated to it, not it to any other field. Where some of our writers draw a line between magic and astrology or between certain other forms of divination and magic, it is apt to be because they approve of the one and feel that they ought to disapprove of the other. Magic appears as a human art or group of arts employing varied materials in varied rites, often fantastic, to work a great variety of marvelous results, which offer man a release from his physical, social, and intellectual limitations, not by the imaginative and sentimental methods of music, melodrama, and romance, nor by religion's spiritual experience, but by operations supposed to be efficacious here in the world of external reality. Some writers lay great stress on resort to spirits in magic, some upon the influences of the heavens, some on both these, and some almost identify the two; but, except as theological dogma insists upon the demoniacal character of magic, it cannot be said that spirits or stars are thought of as always necessary in magic. The *sine qua non* seems to be a human operator, materials, rites, and the aiming

<sup>122</sup> *Ibid.*, 396.

at a result that borders on the impossible, either in itself or because of the means employed.

In our authors it is difficult to account for the occult properties attributed to things and acts, and to discern any one underlying principle, such as sympathy, symbolism, imitation, contagion, resemblance, or association, guiding the selection of materials and rites for magic. This is either because there never was such a principle, or because we deal with a late stage in the development of magic, when the superstitions of different peoples have coalesced, when its peculiar customs have become confused with those of science and religion, after its primitive methods have been artificially over-elaborated, and after many usages have been gradually corrupted and their original meaning forgotten. Whether magic is good or evil, true or false, is with our authors a matter of opinion, in which the majority hold it to be true but evil. Few, however, can avoid a wholesome feeling that there is something false about it somewhere. Finally, our material shows conclusively that the history of magic is bound up with the history of science as well as with folk-lore, primitive culture, and the history of religion.

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## GALEN: THE MAN AND HIS TIMES

By Professor LYNN THORNDIKE

WESTERN RESERVE UNIVERSITY

FOR about fifteen centuries the name of Galen dominated the study of medicine. But at the close of the nineteenth century an English student of the history of medicine said, "Galen is so inaccessible to English readers that it is difficult to learn about him at first hand." Another wrote, "There is, perhaps, no other instance of a man of equal intellectual rank who has been so persistently misunderstood and even misinterpreted." A third obstacle has been that while critical editions of some single works have recently been published by Helmreich and others, no complete edition even of the Greek text of Galen has appeared since that of Kühn of a century ago, which is now regarded as very faulty. A fourth reason for neglect or misunderstanding of Galen is probably that there is so much by him to be read. Athenaeus stated that Galen wrote more treatises than any other Greek, and although many are now lost, more particularly of his logical and philosophical writings, his collected extant works fill some twenty volumes averaging a thousand pages each. There are often no chapter headings or other brief clues to the contents, which must be ploughed through slowly and thoroughly, since some of the most valuable bits of information come in quite incidentally or by way of unexpected digression. Besides errors in the printed text there are numerous words not found in most classical dictionaries. It is therefore perhaps not surprising, in the words of one of the English historians of medicine quoted above, that "few physicians or even scholars in the present day can claim to have read through this vast collection."

Yet Galen deserves to be remembered, not merely as one of the great names, but as one of most original minds and attractive personalities in all the long history of medicine. It is not difficult to make out the main events of his life, his works supply an unusual amount of personal information, and throughout them, unless he is merely transcribing past prescriptions, he talks like a living man, detailing incidents of daily life and making upon the reader a vivid and unaffected impression of reality. Daremberg said of Galen that the exuberance of his imagination and his vanity frequently make us smile. It is true that his pharmacology and therapeutics often strike the modern reader as ridiculous, but he did not imagine them; they were the medicine of his age. It is true that he mentions cases which he has cured and those

where other physicians have been at fault, but official war despatches do the same in the case of their own side's victories and the enemy's defeats. *Vae victis!* In Galen's case, at least, posterity long confirmed his own verdict. And dull or obsolete as much of his medicine now is, his scholarly and intellectual ideals and love of hard work are still a living force, while the reader of his pages often feels himself carried back to the Roman world of the second century.

Galen, who does not seem to have been called Claudius until the time of the Italian Renaissance, was born about 129 A. D. at Pergamum in Asia Minor. His father, an architect and mathematician, transmitted much of this education to his son, but even more valuable, in Galen's opinion, were his precepts to follow no one sect or party but to hear and judge them all, to despise honor and glory, and to magnify truth alone. To this teaching Galen attributed his own peaceful and painless passage through life. He did not grieve over losses of property but managed to get along somehow. He did not mind it much when some vituperated him, but thought instead of those who praised him. In later life Galen looked back with great affection upon his father as the gentlest, justest, most honest and humane of men. On the other hand, the chief lesson he learned from his mother was to avoid her failings of a sharp temper and tongue, whereby she made life miserable for their household slaves and scolded his father worse than Xanthippe ever did Socrates.

In one of his works Galen speaks of the passionate love and enthusiasm for truth which have possessed him since boyhood, so that he has not stopped either by day or by night from quest of it. He realized that to become a true scholar required both high natural qualifications and a superior type of education from the very first. After his fourteenth year he heard the lectures of various philosophers, Platonist and Peripatetic, Stoic and Epicurean; but when about seventeen, warned by a dream of his father, he turned to the study of medicine. The incident of the dream, like many other passages in Galen's works, shows that even men of the finest education and intellectual standards were not free from the current beliefs in occult influences. Galen first studied medicine for four years under Satyrus in his native city of Pergamum; then after his father's death, under Pelops at Smyrna, and later under Numisianus at Corinth and Alexandria. This was about the time that the great mathematician and astronomer, Ptolemy, was completing his observations in the neighborhood of Alexandria, but Galen does not mention him, despite his own belief that a first-rate physician should also understand such subjects as geometry and astronomy, music and rhetoric. Galen's interest in philosophy continued, however, and he wrote many logical and philosophical treatises, most of which are lost.

Galen returned to Pergamum to practice and was, when but twenty-nine, given charge of the health of the gladiators by five successive pontiffs. During his thirties came his first residence in Rome. In two of his works he gives two different explanations for his departure from the capital city. In one he says, "When the great plague broke out there (in the reign of Marcus Aurelius) I hurriedly departed from the city for my native land." In another his explanation is that he became disgusted with the malice of the envious physicians of the capital and determined to return home as soon as the sedition there was over. Meanwhile he gained great fame by his cures, but the jealousy and opposition of the other physicians multiplied, so that presently, when he learned that the sedition was over, he went back to Pergamum.

His fame, however, had come to the imperial ears and he was soon summoned to Aquileia, north of the Adriatic, to meet the emperors on their way north against the Germans who had invaded the frontier. An outbreak of the plague there prevented them from proceeding with the campaign immediately and Galen states that the emperors fled for Rome with a few troops, leaving the rest to suffer from the plague and the cold winter. On the way Lucius Verus died, and when Marcus Aurelius finally returned to the front, he allowed Galen to go back to Rome as court physician to his son Commodus. The prevalence of the plague at this time is illustrated by a third encounter which Galen had with it in Asia, when he claims to have saved himself and others by thorough venesection. The war in which Marcus Aurelius was engaged lasted much longer than had been anticipated and meanwhile Galen was occupied chiefly in literary labors. In 192 some of his writings and other treasures were lost in a fire which destroyed the Temple of Peace on the Sacred Way and the great libraries on the Palatine hill. Of some of the works which thus perished he had no other copy himself. He began one of his works on compound medicines of which two books had been already published all over again because most of the published copies had been destroyed in the fire. Galen was still alive and writing during the early years of the dynasty of the Severi and probably did not die until about 200.

Although the envy of other physicians at Rome and their accusing Galen of resort to magic arts and divination in his marvelous prognostications and cures were perhaps neither the sole nor the true reason for his temporary withdrawal from the capital, there probably is a great deal of truth in the picture he paints of the medical profession and learned world of his day. Too many other ancients, from Vitruvius, Pliny the Elder and Juvenal to Firmicus Maternus in the fourth century, substantiate his charges to permit us to explain them away as the product of personal bitterness or pessimism. We feel that these men lived in an intellectual society where faction and villainy, superstition

and petty-mindedness and personal enmity, were more manifest than in the quieter and, let us hope, more tolerant world of our time. The *status belli* may still characterize politics and the business world, but scholars seem able to live in substantial peace. Perhaps it is because there is less prospect of worldly gain for members of the learned professions than in Galen's day. Perhaps it is due to the growth of the impartial scientific spirit, of unwritten codes of courtesy and ethics within the leading learned professions, and of state laws concerning such matters as patents, copyright, professional degrees, pure food and pure drugs. Perhaps, in the unsatisfactory relations between those who should have been the best educated and most enlightened men of that time we may see a symptom of the general intellectual and ethical decline of the ancient world.

Galen states that many tire of the long struggle with crafty and wicked men which they have tried to carry on, relying upon their erudition and honest toil alone, and withdraw disgusted from the madding crowd to save themselves in dignified retirement. He especially marvels at the evil-mindedness of physicians of reputation at Rome. Though they live in the city, they are a band of robbers as truly as the brigands of the mountains. He is inclined to account for the roguery of Roman physicians compared to those in a smaller city by the facts that elsewhere men are not so tempted by the magnitude of possible gain, and that in a smaller town everyone is known by everyone else and so questionable practices cannot escape general notice. The rich men of Rome fall easy prey to unscrupulous practitioners who are ready to flatter them and to play up to their weaknesses. These rich men can see the use of arithmetic and geometry, which enable them to keep their books straight and to build houses for their domestic comfort, or of divination and astrology, from which they seek to learn whose heirs they will be; but they have no appreciation for pure philosophy aside from rhetorical sophistry.

Galen more than once complains that there are no real seekers after truth in his time, but that all are intent upon money, political power, or pleasure. You know very well, he writes to a friend in one of his works, that not five men of all those whom we have met prefer to be rather than to seem wise. Many who have no real knowledge make a great outward display and pretense in medicine and other arts. Galen several times expresses his scorn for those who spend their mornings in going about saluting their friends, and their evenings in drinking bouts or in dining with the rich and powerful. Yet even his friends have reproached him for studying too much and not "going out" more. But while they have wasted their hours thus, he has spent his, first in learning all that the ancients have discovered that is of value, then in testing and practicing the same. Moreover, now-a-days many are try-



ing to teach others what they have never accomplished themselves. Thessalus not only toadies the rich but secured many pupils by offering to teach them medicine in six months. Hence it is that tailors and dyers and smiths are abandoning their arts to become physicians. Thessalus himself, Galen ungenerously taunts, was educated by a father who plucked wool badly in female apartments. Indeed, Galen himself by the violence of his invective and the occasional passionateness of his animosity in his controversies with other individuals or schools of medicine, illustrates that state of war in the intellectual world of his age to which I have adverted.

I suggested that possibly learning compared to other occupations was more remunerative in Galen's day than in ours, but there were poor physicians and medical students then as well as those who were greedy for gain or who associated with the rich. Many doctors could not afford to use the rarer or stronger simples and limited themselves to easily procured, inexpensive, and homely medicaments. Many of his fellow students regarded as a counsel of perfection unattainable by them Galen's plan of hearing all the different medical sects and comparing their merits and testing their validity. These students said tearfully that this course was all very well for him with his acute genius and his wealthy father behind him, but that they lacked the money to pursue an advanced education, perhaps had already lost valuable time under unsatisfactory teachers, or felt that they did not possess the discrimination to select for themselves what was profitable from several conflicting sects or schools.

Galen was, it has already been made apparent, an intellectual aristocrat, and possessed little patience with those stupid men who never learn anything for themselves, though they see a myriad cures worked before their eyes. But that, apart from his own work, the medical profession was not entirely stagnant in his time, he admits when he asserts that many things are known today which had not been discovered before, and when he mentions some curative methods recently invented at Rome.

Galen supplies considerable information concerning the drug trade in Rome itself and throughout the empire. He often complains of adulteration and fraud. The physician must know the medicinal simples and their properties himself and be able to detect adulterated medicines, or the merchants, perfumers, and *herbarii* will deceive him. Galen refuses to reveal the methods employed in adulterating opobalsam, which he had investigated personally, lest the evil practice spread further. At Rome at least there were dealers in unguents who corresponded roughly to our druggists. Galen says that there is not an unguent-dealer in Rome who is unacquainted with herbs from Crete, but he asserts that there are equally good medicinal plants growing in

the very suburbs of Rome of which they are totally ignorant, and he taxes even those who prepare drugs for the emperors with the same oversight. He tells how the herbs come from Crete wrapped in cartons with the name of the herb written on the outside and sometimes the further statement that it is *campestris*. These Roman drug stores seem not to have kept open at night, for Galen speaks of the impossibility of procuring at once the medicines needed in a certain case, because "the lamps were already lighted."

The emperors kept a special store of drugs of their own and had botanists in Sicily, Crete, and Africa who supplied not only them with medicinal herbs, but, according to Galen, the city of Rome as well. However, the emperors appear to have reserved a large supply of the finest and rarest simples for their own use. Galen mentions a large amount of Hymettus honey in the imperial stores—*εν ταις αυτοκρατορικαις αποθηκαις*—whence our word "apothecary." He proves that cinnamon loses its potency with time by his own experience as imperial physician. An assignment of the spice sent to Marcus Aurelius "from Barbary" was superior to what had stood stored in wooden jars from the preceding reigns of Trajan, Hadrian, and Antoninus Pius while after Commodus had exhausted this recent supply and Galen had to turn again to the older store in preparing an antidote for Severus, he found it still weaker than before. That cinnamon was a commodity little known to the populace is indicated by Galen's mentioning his loss in the fire of 192 of a few precious branches which he had stored away in a chest along with other personal treasures. He praises the Severi, however, for permitting others to use theriac, the noted compound medicine and antidote. Thus, he says, they not only as emperors have received power from the gods, but in sharing their goods freely they resemble the gods, who rejoice the more, the more people they save.

Galen himself, and the same seems to have been true of other physicians, was not content to rely for medicines either upon the unguent sellers or the bounty of the imperial stores. He stored away oil and fat, leaving them to age, until he had enough to last him for a hundred years, including some from his father's lifetime. He used some forty years old in one prescription. He also travelled to many parts of the Roman Empire and procured rare drugs in the places where they were produced. Very interesting is his account of going out of his way in journeying back and forth between Rome and Pergamum in order to stop at Lemnos and procure a supply of the famous *terra sigillata*, a reddish clay stamped into pellets with the sacred seal of Diana. On his way to Rome, instead of journeying on foot through Thrace and Macedonia, he took ship from the Troad to Thessalonica; but the vessel stopped in Lemnos at Myrine on the wrong side of the island—Galen had failed to realize that Lemnos had more than one port, and the

captain would not delay the voyage long enough to enable him to cross the island to the spot where *terra sigillata* was to be found. Upon his return from Rome through Macedonia, however, Galen took pains to visit the right port, and for the benefit of future travelers gives careful instructions concerning the route to follow and the distances between stated points.

Galen also describes the solemn procedure by which the priestess from the neighboring city gathered the red earth from the hill where it was found, sacrificing no animals, but wheat and barley to the earth. He brought away with him some twenty thousand of the little discs or seals, which were supposed to cure even lethal poisons and the bite of mad dogs. The inhabitants laughed, however, at the assertion which Galen had read in Dioscorides that the seals were made by mixing the blood of a goat with the earth. Berthelot, the historian of chemistry, believed that this earth was "an oxide of iron more or less hydrated and impure." C. J. S. Thompson, in a recent paper on "*Terra Sigillata*, a famous medicament of ancient times," tells of various medieval substitutes for the Lemnian earth, and of the interesting religious ceremony performed in the presence of Turkish officials on only one day in the year by Greek monks who had replaced the priestess of Diana. Pierre Belon witnessed this ceremony on August 6th, 1533, by which time there were many varieties of the tablets in existence, "because each lord of Lemnos had a distinct seal." When Tozer visited Lemnos in 1890, the ceremony was still performed annually on the same day, and must be completed before sunrise or the earth would lose its efficacy. Moslem *khodjas* now shared in the religious ceremony, sacrificing a lamb. But in the twentieth century the entire ceremony was abandoned. Through the early modern centuries *terra sigillata* continued to be held in high esteem in western Europe also, and was included in pharmacopaeias as late as 1833 and 1848. Thompson gives a chemical analysis of a sixteenth century tablet of the earth and finds no evidence therein of its possessing any medicinal property.

To come back to Galen, in another passage he advises his readers, if they are ever in Pamphylia, to lay in a good supply of the drug *carpesium*. In a third passage he tells of three strata of sory, chalcite, and misy, which he had seen in a mine in Cyprus thirty years before and from which he had brought away a supply, and of the surprising alteration undergone by the misy in the course of those years. He speaks of receiving other drugs from Great Syria, Palestine, Egypt, Cappadocia, Pontus, Macedonia, Gaul, Spain, and Mauretania, from the Celts, and even from India. He names other places in Greece and Asia Minor than Mount Hymettus where good honey may be had. Much so-called Attic honey is really from the Cyclades, although it is brought to Athens and there sold or re-shipped. Similarly genuine

Falernian wine is produced in but a small section of Italy, but imitations are prepared by those skilled in such knavery. As the best iris is that of Illyricum and the best asphalt from Judaea, so the best petroselinos is that of Macedonia, and merchants export it to almost the entire world, just as they do Attic honey and Falernian wine. But the petroselinos crop of Epirus is sent to Thessalonica (Saloniki) and there passed off for Macedonian. The best turpentine is that of Chios, but a good variety may be obtained from Libya or Pontus. The best form of unguent was formerly made only in Laodicea, but now it is similarly compounded in many other cities of Asia Minor.

We are reminded that parts of animals as well as herbs and minerals were important constituents in ancient pharmacy by Galen's invective against the frauds of hunters and dealers in wild beasts as well as of unguent-sellers. They do not hunt the animals at the proper season for securing their medicinal virtues, but when they are no longer in their prime or just after their long period of hibernation, when they are emaciated. Then they fatten them upon improper food, feed them barley cakes to stuff up and dull their teeth, or force them to bite frequently so that virus will run out of their mouths. The beasts of course were also in demand for the games of the arena.

Besides the ancient drug trade, Galen gives us some interesting glimpses of the publishing trade, if we may so term it, of his time. Writing in old age, he says that he has never attached his name to his works and has never written for the popular ear or for fame, but fired by zeal for science and truth, or at the urgent request of friends, or as a useful exercise for himself, or, as now, in order to forget his old age. He regards popular fame as only an impediment to those who desire to live tranquilly and enjoy the fruits of philosophy. He asks Eugenianus not to praise him immoderately before men, as he has been wont to do, and not to inscribe his name in his works. His friends nevertheless prevailed upon Galen to write two treatises listing his works, and he also is free enough in many of his writings in mentioning others which it is essential to read before perusing the present volume. Perhaps he felt differently at different times on the question of fame and anonymity. He also objected to those who read his works, not to learn anything from them, but only in order to calumniate them.

It was in a shop on the Sacra Via that most of the copies of some of Galen's works were stored when they, together with the great libraries upon the Palatine, were consumed in the fire of 192. But in another passage he states that the street of the Sandal-makers is where most of the book-stores of Rome are located. There he saw some men disputing whether a certain treatise was his. It was duly inscribed *Galenus medicus* and one man, because the title was unfamiliar to him, had just purchased it as a new work by Galen. But another man who

was something of a philologist asked to see the introduction, and, after reading a few lines, declared that the book was not one of Galen's works. When Galen was still young, he wrote three commentaries on the throat and lungs for a fellow student who wished to have something to pass off as his own work upon his return home. This friend died, however, and the books got into circulation. Galen also complains that notes of his lectures which he had not intended for publication have got abroad, that his servants have stolen and published some of his manuscripts, and that others have been altered, corrupted, and mutilated by those into whose possession they have come, or have been passed off by them in other lands as their own productions. On the other hand, some of his pupils keep his teachings to themselves and are unwilling to give others the benefit of them, so that if they should die suddenly, his doctrines would be lost. His own ideal has always been to share his knowledge freely with those who sought it, and if possible with all mankind. At least one of his works was taken down from his dictation by short-hand writers, when, after his convincing demonstration by dissection concerning respiration and the voice, Boethus asked him for commentaries on the subject and sent for stenographers. Although Galen in his travels often purchased and carried home with him large quantities of drugs, when he made his first trip to Rome he left all his library in Asia.

Galen dates the practice of falsifying the title pages and contents of books back to the time when kings Ptolemy of Egypt and Attalus of Pergamum were bidding against each other for volumes for their respective libraries. At that time works were often interpolated in order to make them larger and so bring a better price. Galen speaks more than once of the deplorable ease with which numbers, signs, and other abbreviations are altered in manuscripts. A single stroke of the pen or slight erasure will completely change the meaning of a medical prescription. He thinks that such alterations are sometimes malicious and not mere mistakes. So common were they that Menecrates composed a medical work written out entirely in complete words and entitled *Autocrator Hologrammatos* because it was also dedicated to the emperor. Another writer, Damocrates, from whom Galen often quotes long passages, composed his book of medicaments in metrical form so that there might be no mistake made even in complete words.

Galen's works contain occasional historical information concerning many other matters than books and drugs. Clinton made much use of Galen for the chronology of the period in his *Fasti Romani*. Galen's allusions to several of the emperors with whom he had personal relations are valuable bits of source-material. Trajan was, of course, before his time, but he testifies to the great improvement of the roads in Italy which that emperor had effected, comparing his own systematic

treatment of medicine to the emperor's great work in repairing and improving the roads, straightening them by cut-offs that saved distance, but sometimes abandoning an old road that went straight over hills for an easier route that avoided them, filling in wet and marshy spots with stone or crossing them by causeways, bridging impassable rivers, and altering routes that led through places now deserted and beset by wild beasts so that they would pass through populous towns and more frequented areas. The passage thus bears witness to a shifting of population. Galen also sheds a little light on the vexed question of the number of persons in the empire, if Pergamum is the city he refers to in his estimate of 40,000 citizens or 120,000 inhabitants, including women and slaves but perhaps not children.

The evils of ancient slavery are illustrated by an incident which Galen relates to show the inadvisability of giving way to one's passions, especially anger. Returning east from Rome, Galen fell in with a traveler from Gortyna in Crete. When they reached Corinth, the Cretan sent his baggage and slaves to Athens by boat, but himself with a hired vehicle and two slaves went by land with Galen through Megara, Eleusis, and Thriasa. On the way the Cretan became so angry at the two slaves that he hit them with his sheathed sword so hard that the sheath broke and they were badly wounded. Fearing that they would die, he then made off to escape the consequences of his act, leaving Galen to look after the wounded. But later he rejoined Galen in penitent mood and wished Galen to administer a beating to him for his cruelty. Galen adds that he himself, like his father, had never struck a slave with his own hand and had reproved friends who had broken their slaves' teeth with blows of their fists. Other men were accustomed to kick their slaves or gouge their eyes out. The emperor Hadrian was said in a moment of anger to have blinded a slave with a stylus which he had in his hand. He, too, was sorry afterwards and offered the slave money, which the latter refused, telling the emperor that nothing could compensate him for the loss of an eye. In another passage Galen discusses how many slaves and how much clothing one really needs.

Galen also depicts the easy-going, sociable, and pleasure-loving society of his time. Not only physicians but men generally began the day with salutations and calls, then separated, some to the marketplace and law courts, others to watch the dancers or charioteers. Others played at dice or pursued love-affairs, or passed the hours at the baths or in eating and drinking or some other bodily pleasure. In the evening they came together again at symposia which bore no resemblance to the intellectual feasts of Socrates and Plato but were mere drinking bouts. Galen, however, had no objection to the moderate use of wine, and mentions the varieties from different parts of the Mediterranean

world which were especially noted for their medicinal properties. He believed that discreet indulgence in wine aided digestion and the blood, and relieved the mind from all worry and melancholy and refreshed it. "For we use it every day." He classed wine with such boons to humanity as medicine, "a sober and decent mode of life," and "the study of literature and liberal disciplines." His three books on food values (*De alimentorum facultatibus*) supply information concerning the ancient table and dietary science.

Galen's allusions to Judaism and Christianity are of considerable interest. He seems scarcely to have distinguished between them. In criticizing Archigenes for using vague and unintelligible language and not giving a sufficient explanation of the point in question, Galen says that it is "as if one had come to a school of Moses and Christ and had heard undemonstrated laws." And in criticizing opposing sects for obstinacy Galen says that it would be easier to win over the followers of Moses and Christ. In a third passage Galen criticized the Mosaic view of the relation of God to nature, resenting it as the opposite extreme to the Epicurean doctrine of a purely mechanistic and materialistic universe. This suggests that Galen had read some of the Old Testament, but he might have learned from other sources of the Dead Sea and of apples of Sodom, of which he speaks in yet another context. According to a thirteenth century Arabian biographer of Galen, he spoke more favorably of Christians in a lost commentary upon Plato's *Republic*, admiring their morals and admitting their miracles. This last is unlikely, since Galen believed in a Supreme Being who worked only through natural law.

Like most thoughtful men of his time, Galen tended to believe in one supreme deity, but he appears to have derived this conception from Greek rather than Hebraic sources. It was to philosophy and the Greek mysteries that he turned for revelation of the deity. Hopeless criminals were for him those whom neither the Muses nor Socrates could reform. It is Plato, not Christ, whom in another treatise he cites as describing the first and greatest God as ungenerated and good. "And we all naturally love Him, being such as He is from eternity."

But while Galen's monotheism cannot be regarded as of Christian or Jewish origin, it is possible that his argument from design and supporting theology by anatomy made him more acceptable both to Mohammedan and Christian readers. At any rate he had Christian readers at Rome at the opening of the third century, when a hostile controversialist complains that some of them even worship Galen. These early Christian enthusiasts for natural science, who also devoted much time to Aristotle and Euclid, were finally excommunicated; but Aristotle, Euclid, and Galen were to return in triumph in medieval learning.



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## THE LATIN PSEUDO-ARISTOTLE AND MEDIEVAL OCCULT SCIENCE

The immense influence of Aristotle upon medieval learning has long been recognized, and sometimes unduly emphasized. The tendency to speak of it in sweeping generalities has been largely due to a lack of detailed research on the subject based upon the medieval manuscripts themselves. Take, for example, the medieval Latin translations of the works of Aristotle generally received as genuine. The only investigation of the problem as a whole is that of Jourdain made a century ago and now quite inadequate.<sup>1</sup> Since then the translations of two or three individual works have been separately investigated,<sup>2</sup> but the recent work of Grabmann,<sup>3</sup> while more general in scope, omits the twelfth century entirely and is in the main a disappointing compilation. If so little real attention has been given to translations of the genuine works of Aristotle, still less have the writings of the Pseudo-Aristotle been satisfactorily investigated and surveyed.<sup>4</sup> In this article I propose to give some account—based chiefly upon the medieval manuscripts themselves, although in some cases the works have been printed in early editions—of those works of the Pseudo-Aristotle which deal with natural and more especially occult science. It is these that are most closely connected with the Alexander legend and from which the vernacular literature on Alexander doubtless borrowed

<sup>1</sup> Amable Jourdain, *Recherches critiques sur l'âge et l'origine des traductions latines d'Aristote*, Paris, 1819; 2nd edition, 1843.

<sup>2</sup> Such as P. Duhem, "Du temps où la scolastique latine a connu la physique d'Aristote," in *Revue de philosophie*, (1909) pp. 163-78; and C. H. Haskins, "Medieval Versions of the Posterior Analytics," in *Harvard Studies in Classical Philology*, XXV (1914) pp. 87-105.

<sup>3</sup> Martin Grabmann, *Forschungen über die lateinischen Aristoteles-Übersetzungen des XIII Jahrhunderts*, Münster, 1916. He gives but three pages to the Pseudo-Aristotle.

<sup>4</sup> The works of V. Rose, *Aristoteles Pseudepigraphus* and *De ordine et auctoritate librorum Aristotelis*; Munk's article, "Aristote" in *La France littéraire*; Schwab, *Bibliographie d'Aristote*, Paris, 1896; R. Shute, *History of the Aristotelian Writings*, Oxford, 1888; are largely limited to antiquity and in so far as they deal with the Pseudo-Aristotle at all, scarcely reach the middle ages.

some of its stories.<sup>5</sup> It is indeed very difficult to distinguish works of occult science ascribed to Alexander from those attributed to Aristotle or to distinguish the stories told of Alexander in the works of the Pseudo-Aristotle from those found elsewhere. I shall therefore include some of both of these. I do not, however, intend to include here the early medieval stories of Alexander and Nectanebus in the Pseudo-Callisthenes, Julius Valerius and his epitomes, the Letter of Alexander to Aristotle on the marvels of India, and so on. These early medieval Greek and Latin bases of the medieval Alexander legend have been much studied and discussed. My study is rather of twelfth and thirteenth century Latin treatises ascribed to Aristotle and Alexander which have been largely neglected.<sup>6</sup>

It is not surprising that many spurious works were attributed to Aristotle in the middle ages, when we remember that his writings came to them for the most part indirectly through corrupt translations, and that some writing from so great a master was eagerly looked for upon every subject in which they were interested. It seemed to them that so encyclopedic a genius must have touched on all fields of knowledge and they often failed to realize that in Aristotle's time the departments of learning had been somewhat different from their own and that new interests and doctrine had developed since then. There was also a tendency to ascribe to Aristotle any work of unknown or uncertain authorship. At the close of the twelfth century Alexander Neckam<sup>7</sup> lists among historic instances of envy Aristotle's holding back from posterity certain of his most subtle writings, which he ordered should be buried with him. At the same time he so guarded the place of his sepulcher, whether by some force of nature or power of art or prodigy of

<sup>5</sup> Ch. Gidel, "La Légende d'Aristote au moyen âge," in *Assoc. des études grecques*, (1874) pp. 285-332, except for the Pseudo-Callisthenes uses only the French vernacular literature or popular legends concerning Aristotle. Similar in scope is W. Hertz, "Aristoteles in den Alexanderdichtungen des Mittelalters," in *Abhandl. d. philos.-philol. Classe d. k. bayr. Akad. d. Wiss.*, XIX (1892) pp. 1-103; revised in W. Hertz, *Gesammelte Abhandlungen*, 1905, pp. 1-155.

<sup>6</sup> G. H. Luquet, who wrote on "Aristote et l'université de Paris pendant le XIIIe siècle" in *Bibl. hautes études, Sciences relig.*, XVI, 2, 1904, announced a general work on the knowledge of Aristotle's writings and teachings in the middle ages, but it does not seem to have appeared.

<sup>7</sup> *De naturis rerum*, II, 189.

magic is uncertain, that no one has yet been able to approach it, although some think that Antichrist will be able to inspect these books when he comes. Roger Bacon in the thirteenth century believed that Aristotle had written over a thousand works and complained bitterly because certain treatises, which were probably really apocryphal, had not been translated into Latin.<sup>8</sup> Indeed, some of the works ascribed to Aristotle in the Oriental and Mohammedan worlds were never translated into Latin, such as the astrological *De impressionibus coelestibus* which Bacon mentions, or the Syriac text which K. Ahrens edited in 1892 with a German translation as "Das Buch der Naturgegenstände," or first appeared in Latin guise after the invention of printing, as was the case with the so-called *Theology* of Aristotle,<sup>9</sup> a work which was little more than a series of extracts from the *Enneads* of Plotinus.<sup>10</sup> Some of the treatises attributed to Aristotle which were current in medieval Latin do not bear especially upon our investigation, such as the *Grammar* which Robert Grosseteste is said to have translated from the Greek.<sup>11</sup>

For our purposes the Pseudo-Aristotelian writings may be sub-divided under seven heads: experiment, alchemy, astrology, spirits, occult virtues of stones and herbs, chiromancy and physiognomy, and last the famous "Secrets of Secrets." Under the first of these heads may be put a treatise on the conduct of waters, which consists of a series of experiments in syphoning and the like illustrated in the manuscript by lettered and colored figures and diagrams.<sup>12</sup> In a Vatican manuscript it is perhaps more correctly ascribed to Philo of Byzantium.

<sup>8</sup> *Compendium Studii Philosophiae*, ed. Brewer, (1859) p. 473.

<sup>9</sup> It was translated into Arabic about 840 A.D.; an interpolated Latin paraphrase of it was published at Rome in 1519, by Pietro Niccolo de' Castellani,—*Sapientissimi Aristotelis Stagiritae Theologia sive mistica philosophia, secundum Aegyptios noviter reperta et in latinam castigatissime redacta*; a French version appeared at Paris in 1572 (Carra de Vaux, *Avicenne*, p. 74). F. Dieterici translated it from Arabic into German in 1883, after publishing the Arabic text for the first time in 1882. For divergences between this Arabic text and the Latin one of 1519, and citation of Baumgartner that the *Theology* was known in Latin translation as early as 1200, see Grabmann (1916), pp. 245-7.

<sup>10</sup> Indeed Carra de Vaux, *Avicenne*, p. 73 says, "Tout un livre qui ne contient en réalité que des extraits des Enneades IV à VI de Plotin."

<sup>11</sup> See Arundel MS. 165, 14th century.

<sup>12</sup> Sloane MS. 2039, fols. 110-13.

From experiment to alchemy is an easy step, for the alchemists experimented a good deal in the period which we are now considering. The fourth book of the *Meteorology* of Aristotle, which, if not a genuine portion of that work, at least goes back to the third century before Christ,<sup>13</sup> has been called a manual of chemistry,<sup>14</sup> and apparently is the oldest such extant. Its doctrines are also believed to have been influential in the development of alchemy; and there were passages in this fourth book which led men later to regard Aristotle as favorable to the doctrine of the transmutation of metals. Gerard of Cremona had translated only the first three books of the *Meteorology*; the fourth was supplied from a translation from the Greek made by Henricus Aristippus who died in 1162; to this fourth book were added three chapters translated by Alfred of England or of Sarchel from the Arabic,<sup>15</sup> apparently of Avicenna.<sup>16</sup> These additions of Alfred from Avicenna discussed the formation of

<sup>13</sup> Hammer-Jensen, "Das sogenannte IV Buch der Meteorologie des Aristoteles," in *Hermes*, vol. 50 (1915) pp. 113-36, argues that its teachings differ from those of Aristotle and assigns it to Strato, his younger contemporary. Not content with this thesis, which is easier to suggest than to prove, Hammer-Jensen contends that it was a work of Strato's youth and that it profoundly influenced Aristotle himself in his last works. "The convenient Strato!" as he is called by Loveday and Forster in the preface to their translation of *De coloribus* (1913) vol. VI of *The Works of Aristotle* translated into English under the editorship of W. D. Ross.

<sup>14</sup> So Hammer-Jensen, p. 113 and earlier Heller (1882) 1, 61.

<sup>15</sup> Nürnberg Stadtbibliothek (centur. V, 59, membr. 13th century)—cited by Rose, *Hermes* 1, 385—"Completo est liber metheorum cuius tres primos libros transtulit magister Gerardus Lombardus summus philosophus de arabico in latinum. Quantum autem transtulit Henricus Aristippus de greco in latinum. Tria ultima capitula transtulit Aluredus Anglicus sarensis de arabico in latinum."

Steinschneider (1893) pp. 59 and 84; (1905) p. 7; and others, including Hammer-Jensen, give the name of the translator of the fourth book from the Greek as Hermann and of the last three chapters as Aurelius, whom Steinschneider is more correct in describing as "otherwise unknown." On the other hand, we know that Aristippus and Alfred translated other Aristotelian treatises. Evidently Steinschneider and the others have followed MSS where the copyist has corrupted the proper names.

<sup>16</sup> Steinschneider and Hammer-Jensen quote from MSS, "tria vero ultima Avicennae capitula transtulit Aurelius de arabico in latinum." Albertus Magnus, *Mineral*. III, i, 9, also ascribed the passage to Avicenna; others have suggested that it is by disciples of Avicenna. See J. Wood Brown (1897) pp. 72-3, for a similar passage from Avicenna's *Sermo de generatione lapidum*.

metals but attacked the alchemists.<sup>17</sup> Vincent of Beauvais<sup>18</sup> and Albertus Magnus<sup>19</sup> were both aware, however, that this attack upon the alchemists was probably not by Aristotle. The short treatise *On colors*,<sup>20</sup> which is included in so many medieval manuscript collections of the works of Aristotle in Latin,<sup>21</sup> by its very title would suggest to medieval readers that he had been interested in the art of alchemy, although its actual contents deal only in small part with dyes and tinctures. Its form and contents are not regarded as Aristotle's but it was perhaps by someone of the Peripatetic school. Thus works which, if not by Aristotle himself, at least had been written in Greek long before the medieval period, gave medieval readers the impression that Aristotle was favorable to alchemy.

It is therefore not surprising that works of alchemy appeared in medieval Latin under Aristotle's name. The names of Plato and Aristotle had headed the lists of alchemists in Greek manuscripts although no works ascribed to Aristotle have been preserved in the same. Berthelot, however, speaks of a pseudo-Aristotle in Arabic,<sup>22</sup> and in an Oxford manuscript of the thirteenth century under the name of Aristotle appears a treatise *On the twelve waters of the secret river* said to be "translated

<sup>17</sup> They were printed at Bologna, 1501, as *Liber de mineralibus Aristotelis* and also published, sometimes as Geber's sometimes as Avicenna's, under the title, *Liber de congelatione*.

BN 16142 contains a Latin translation of the four books of the *Meteorology* with an addition dealing with minerals and geology which is briefer than the printed *Liber de mineralibus Aristotelis*, omitting the passage against the alchemists: published by F. de Mély, *Rev. des Études grecques*, (1894) p. 135 et seq. (cited Hammer-Jensen, 131).

<sup>18</sup> *Speculum naturale*, VIII, 85.

<sup>19</sup> See note 16 above.

<sup>20</sup> Greek text by Prantl, Teubner, 1881; English translation by Loveday and Forster, 1913. See also Prantl, *Aristoteles über die Farben*, 1849.

<sup>21</sup> Just a few examples are: Mazarine 3458 and 2459, 13th century; 3460 and 3461, 14th century; Arsenal 748A, 15th century, fol. 185; BN 6325, 14th century, No. 1; BN 14719, 14-15th century, fol. 38-; BN 14717, end 13th century; BN 16633, 13th century, fol. 102-; S. Marco, 13th century, beautifully illuminated, fols. 312-17; Assisi 283, 14th century, fol. 289-; Volterra 19, 14th century, fol. 196-.

<sup>22</sup> Berthelot (1885) p. 143, "Platon et Aristote sont mis en tête de la liste des alchimistes œcuméniques sans qu'aucun ouvrage leur soit assigné."

<sup>23</sup> Berthelot (1888) I, 76; citing Manget, *Bibl. Chemica*, I, 622.

from Arabic into Latin.”<sup>24</sup> In the preface the author promises that whoever becomes skilled, adept, and expert in these twelve waters will never lose hope nor be depressed by want. He regards this treatise as the chief among his works, since he has learned these waters by experiment. They are all chemical rather than medical; a brief “chapter” or paragraph is devoted to each. In another manuscript at the Bodleian two brief tracts are ascribed to Aristotle; one describes the seven metals, the other deals with transmutation.<sup>25</sup> In a single manuscript at Munich both a theoretical treatise in medicine and alchemy and a *Practica* are attributed to Aristotle, and in two other manuscripts he is credited with the *Book of Seventy Precepts* which sometimes is ascribed to Geber.<sup>26</sup> Thomas of Cantimpré cites Aristotle in the *Lumen luminum* as saying that the best gold is made from yellow copper ore and the urine of a boy, but Thomas hastens to add that such gold is best in color rather than in substance.<sup>27</sup> The translation of the *Lumen luminum* is ascribed both to Michael Scot and brother Elias.<sup>28</sup> Aristotle is quoted several times in *De alchimia*, ascribed to Albertus Magnus, but only in

<sup>24</sup> Digby 162, 13th century, fols. 10v-11v, “Incipit liber Aristotelis de aquis secreti fluminis translatus ab arabico in latinum.” In the margin the twelve waters are briefly designated: 1 rubicunda, 2 penetrativa, 3 mollificativa, et ingrediente, 4 de aqua eiusdem ponderis et magnitudinis, 5 ignita, 6 sulphurea, 7 aqua cineris, 8 aurea, etc. In one or two cases, however, these heads do not quite apply to the corresponding chapters.

<sup>25</sup> Ashmole 1448, 15th century, pp. 200-202, de “altitudinibus, profundis, lateribusque,” metallorum secundum Aristotelem (name in the margin). It opens, “Plumbum est in altitudine sua ar. nigrum.” It takes up in turn the *altitudo* of each metal and then discusses the next quality in the same way.

Ibid., pp. 239-44, opens, “Arestotilus, Cum studii etc. Scias preterea quod propter longitudes”; at p. 241 it treats “de purificatione solis et lune” (i. e. gold and silver), at p. 243, “de separatione solis et lune.” It ends with a paragraph about the composition of a golden seal.

<sup>26</sup> CLM 12026, 15th century, fol. 46-, “Alchymia est ars docens. . . . . Explicit dicto libri (*sic*) Aristotelis de theorica in rebus naturalibus; fol. 78, Liber Aristotelis de practica summae philosophiae, “Primo de separatione salis communis. . . .”

CLM 25110, 15th century, fols. 211-45, Liber Aristotelis de 70 preceptis.

CLM 25113, 16th century, fols. 10-28, A. de alchimia liber qui dicitur de 70 preceptis.

<sup>27</sup> Egerton 1984, fol. 141v; in the *De natura rerum*.

<sup>28</sup> Riccardian MS. 119, fols. 35v and 166r.

the later "Additions" to it, where Roger Bacon also is cited, is the specific title *Liber de perfecto magisterio* given as Aristotle's.<sup>29</sup> Sometimes works of alchemy were very carelessly ascribed to Aristotle, when it is perfectly evident from the works themselves that they could not have been written by him.<sup>30</sup>

The alchemical discoveries and writings ascribed to Aristotle are often associated in some way with Alexander the Great as well. In one manuscript John of Spain's translation of the *Secret of Secrets* is followed by a description of the virtues and compositions of four stones "which Aristotle sent to Alexander the Great."<sup>31</sup> It seems obvious that these are philosopher's stones and not natural gems. The *Liber ignium* of Marcus Grecus, composed in the thirteenth or early fourteenth century, ascribes to Aristotle the discovery of two marvelous kinds of fires. One, which he discovered while traveling with Alexander the king, will burn for a year without cessation. The other, in the composition of which observance of the dog-days is requisite, "Aristotle asserts will last for nine years."<sup>32</sup> A collection of chemical experiments by a Nicholas, perhaps de Bodlys and of Poland and Montpellier, gives "a fire which Aristotle discovered with Alexander for obscure places."<sup>33</sup> A letter of Aristotle to Alexander in a collection of alchemical tracts is hardly worth noting, as it is only seven lines long, but it is interesting to observe that it cites Aristotle's *Meteorology*.<sup>34</sup> Perhaps by a mistake one or

<sup>29</sup> Caps. 22 and 57. It was printed with further "Additions" of its own in 1561 in *Verae alchemiae artisque metallicae citra aenigmata*, Basel, 1561, 11, 188-225.

<sup>30</sup> Thus in *Auriferae artis quam chemiam vocant antiquissimi auctores*, Basel, 1572, pp. 387-99, a treatise which cites Morienus, Rasis, and Avicenna is printed as *Tractatulus Aristotelis de Practica lapidis philosophici*. Apparently the only reason for ascribing it to Aristotle is that it cites "the philosopher" in its opening sentence, "Cum omne corpus secundum philosophum aut est elementum aut ab elementis generatum."

<sup>31</sup> Laud Misc. 708, 15th century, fol. 54.

<sup>32</sup> Berthelot (1893) I, 105 and 107.

<sup>33</sup> Ashmole 1448, 15th century, p. 123.

<sup>34</sup> Ashmole 1450, 15th century, fol. 8, "Epistola ad Alexandrum. O Alexander rector hominum. . . . et audientes non intelligant."

Harleian 3703, 14th century, fols. 41r-42r, Aristoteles ad alexandrum. "In primo o elaxandor tradere tibi volo secretorum maximum secretum. . .," is a similar treatise.

two alchemical treatises are ascribed to Alexander rather than Aristotle.<sup>35</sup>

Aristotle's genuine works give even more encouragement to the pretensions of astrology than to those of alchemy. His opinion that the four elements were insufficient to explain natural phenomena and his theory of a fifth essence were favorable to the belief in occult virtue and the influence of the stars upon inferior objects. In his work on generation<sup>36</sup> he held that the elements alone were mere tools without a workman; the missing agent is supplied by the revolution of the heavens. In the twelfth book of the *Metaphysics* he describes the stars and planets as eternal and acting as intermediaries between the prime Mover and inferior beings. Thus they are the direct causes of all life and action in our world. Charles Jourdain regarded the introduction of the *Metaphysics* into western Europe at the opening of the thirteenth century as a principal cause for the great prevalence of astrology from that time on, the other main cause being the translation of Arabian

<sup>35</sup> Ashmole 1384, mid 14th century, fols. 91v-93r, "Incipit Epistola Alexandri. Dicunt philosophi quod ars derivata sit ex creatione hominis cui omnia insunt . . . / . . . ex omni specie et colore nomine. Explicit epistola Alexandri." In the text itself, which is written in the manner of a master to a disciple, there is nothing to show that the work is by Alexander rather than Aristotle.

The following is apparently the same treatise but the closing words are different.

Riccard. 1165, 15th century, fols. 161-3, Liber Alexandri in scientia secretorum nature. "Dicitur quod hec ars derivata sit ex creacione hominis cui omnia insunt . . . / . . . et deo annuente ad optatum finem pervenies."

The next would seem to be another treatise than the foregoing.

Arezzo 232, 15th century, fols. 1-14, "Liber transmissus ab Alexandro rege ex libro Hermogenis."

Hermogenes, who is cited on the subject of the philosopher's stone in at least one MS of the Secret of Secrets (Bodleian 67, fol. 33v, "Et pater noster Hermogenes qui triplex est in philosophia optime philosophando dixit"), is apparently none other than Hermes Trismegistus. He is also mentioned in a brief work of *Aristotle to Alexander*; Harleian 3703, 14th century, fols. 41r-42r, ". . . hermogenes quod (*sic*) egypti multum commendunt et laudant et sibi attribuant omnem scientiam secretam et celerem (?)." The use of the reflexive pronoun in this sentence to refer to Hermogenes I would have the reader note, as it appears to illustrate a fairly common medieval usage.

<sup>36</sup> II, 9.



astrological treatises.<sup>37</sup> Jourdain did not duly appreciate the great hold which astrology already had in the twelfth century, but it is nevertheless true that in the new Aristotle astrology found further support.

Astrology crops out here and there in most of the spurious works extant under Aristotle's name, just as it does in the medieval learning everywhere. One section of a dozen pages in the *Theology* discusses the influence of the stars upon nature and the working of magic by making use of these celestial forces and the natural attraction which things have for one another. It regards artificial magic as a fraud, but natural and astrological magic as a reality. However, it is only the animal soul which is affected by magic and the man of impulse who is moved thereby; the thinking man can free himself from its influence by use of the rational soul. In the treatise, *De pomo*,<sup>38</sup> which seems not to have been translated into Latin until the thirteenth century under Manfred,<sup>39</sup> Aristotle on his death bed, holding in his hand an apple from which the treatise takes its title, is represented as telling his disciples why a philosopher need not fear death and repudiating the doctrines of the mortality of the soul and eternity of the universe. He also tells how the Creator made the spheres and placed lucid stars in each and gave them the virtue of ruling over this inferior world and causing good and evil and life or death. They do not, however, do this of themselves, but men at first thought so and erroneously worshiped the stars until the time of Noah who was the first to recognize the Creator of the spheres.<sup>40</sup>

<sup>37</sup> *Excursions historiques*, etc., p. 562.

<sup>38</sup> I have read it in an incunabulum edition numbered IA.49867 in the British Museum.

<sup>39</sup> Ibid., fols. 21v-23r, "Nos Manfredus divi augusti imperatoris frederici filius dei gratia princeps tharentinus honoris montis sancti angeli dominus et illustris regis conradi servi in regno sicilie baiulus . . . quem librum cum non inveniretur inter cristianos, quoniam eum in ebrayco legimus translatum de arabico in hebreum, sanitate rehabita ad eruditionem multorum et de hebrea lingua transtulimus in latinam in quo a compilatore quedam recitabilia inseruntur. Nam dictum librum aristotiles non notavit sed notatus ab aliis extitit qui causam hylaritatis seu mortis discere voluerunt sicut in libri serie continetur."

<sup>40</sup> Edition No. IA.49867 in the British Museum, fols. 25v-26r.

There are also attributed to Aristotle treatises primarily astrological. A "Book on the Properties of the Elements and of the Planets" is cited under his name by Peter of Abano at the end of the thirteenth century in his work on poisons,<sup>41</sup> by Peter d'Ailly in his *Vigintiloquium*<sup>42</sup> written in 1414, and by Pico della Mirandola, who declares it spurious, in his work against astrology written at the close of the fifteenth century. D'Ailly and Pico cite it in regard to the theory of great conjunctions; Abano, for a tale of Socrates and two dragons which we shall repeat later. It is probable that all these citations were from the paraphrase of and commentary on the work by Albertus Magnus<sup>43</sup> who accepted it as a genuine writing of Aristotle.

In a manuscript of the Cotton collection in the British Museum is a work of some length upon astrology ascribed to Aristotle.<sup>44</sup> After a discussion of general principles in which the planets, signs, and houses are treated, there are separate books upon the subjects of nativities,<sup>45</sup> and of elections and interrogations.<sup>46</sup> In a Paris manuscript a treatise on interrogations is ascribed in a marginal heading to "Aristoteles Milesius, a Peripatetic physician."<sup>47</sup> In the Cotton Manuscript in commentaries which then follow, and which are labelled as commentaries "upon the preceding treatise" Ptolemy is mentioned rather than Aristotle.<sup>48</sup> In an astrological manuscript of the fifteenth century at Grenoble written in French, works of Messahala and

<sup>41</sup> Cap. 4.

<sup>42</sup> Verbum 4.

<sup>43</sup> *De causis et proprietatibus elementorum*, IX, 585-653 in Borgnet's edition of Albert's works; Albert himself in his treatise on Minerals cites the title as "Liber de causis proprietatum elementorum et planetarum."

<sup>44</sup> Cotton Appendix VI, fol. 8r, "liber iste est aristotelis in scientia ipsius astronomie."

<sup>45</sup> fol. 11v, "Alius liber de nativitatibus"; opens, "Superius prout potuimus promissorum partem explevimus."

<sup>46</sup> fol. 13r, "De electionibus alius liber;" opens, "Unde constellationibus egyptios imitantes nativitates satis dilucide dixerimus." This book intermingles the subjects of interrogations and elections, and ends at fol. 20v, "Finit liber de interrogationibus."

<sup>47</sup> BN 16208, fol. 76r—, "liber arystotelis milesii medici perypathetici in principiis iudiciorum astronomorum in interrogationibus."

<sup>48</sup> Cotton Appendix VI, fol. 20v, "Incipit commentum super praemissa scilicet praedictum librum" fol. 23v, "Expositio ad litteram superioris tractatus. Ptolomaeus summus philosophus et excellentissimus egyptiorum rex. . . ."

Zaë translated for Charles V of France are preceded by "a book of judicial astrology according to Aristotle," which opens with "the preface of the last translator," and is in four parts.<sup>49</sup> Perhaps both the above-mentioned manuscripts contain, like a third manuscript at Munich, "The book of judgments which is said by Albert in his *Speculum* to be Aristotle's."<sup>50</sup> This work also occurs in a manuscript at Erfurt.<sup>51</sup> Roger Bacon was much impressed by an astrological treatise ascribed to Aristotle entitled *De impressionibus coelestibus*, and told Pope Clement IV that it was "superior to the entire philosophy of the Latins and can be translated by your order."<sup>52</sup>

A treatise found in two manuscripts of the Bodleian Library bears the titles, *Commentary of Aristotle on Astrology* and *The book of Aristotle from two hundred and fifty-five volumes of the Indians, containing a digest of all problems, whether pertaining to the sphere or to genethliology*.<sup>53</sup> From the text itself and the preface of Hugh Sanctellensis, the twelfth century translator from Arabic into Latin, addressed to his lord, Michael, bishop of Tarazona, we see that the work is neither entirely by Aristotle nor from the books of the Indians but is a compilation by someone who draws or pretends to draw from some 250 or 255 books<sup>54</sup> of the philosophers, including in addition to treatises by both Aristotle and the Indians, 13 books by Hermes, 13 by Doronius (Dorotheus?), 4 by Ptolemy, one by Democritus, two by Plato, 44 by the Babylonians, 7 by Antiochus, and others by authors whose names are unfamiliar to me and probably misspelled in

<sup>49</sup> Grenoble 814, fols. 1-24. "Cy commence le livre de jugemens d'astrologie selon Aristote. Le prologue du derrenier translateur. Aristote fist un livre de jugemens. . . ."

<sup>50</sup> CLM 25010, 15-16th century, fols. 1-12, "liber de iudiciis qui ab Alberto in Speculo suo dicitur esse Aristotelis."

<sup>51</sup> Amplon. Quarto 377, 14th century, fols. 25-36, de iudiciis astrorum. Schum identifies it with the work ascribed to Aristotle by Albert in the *Speculum astronomiae*.

<sup>52</sup> Bridges (1897) I, 381, 389-90; Brewer (1859) p. 473.

<sup>53</sup> Digby, 159, 14th century, fols. 87, mutilated at the end. "Liber Aristotelis de ducentis lveque Indorum voluminibus, universalium questionum tam genecialium quam circularium summam continens." At fol. 5v, "Explicit prologus. Incipit Aristotelis commentum in astrologiam." This is the MS which I have chiefly followed.

Savile Latin 15 (Bernard 6561), 15th century, fols. 185-204v, is similar.

<sup>54</sup> In the text the number is given as ccl; see Digby 159, fol. 2r.

the manuscripts. In one of the works of Aristotle of which the present work is supposed to make use, there are said to have been described the nativities of twelve thousand men, collected in an effort to establish an experimental basis for astrology.<sup>55</sup> It is not so surprising that the present work bears Aristotle's name, since Hugh had promised his patron Michael, in the prologue to his translation of the *Geometry* of Hanus ben Hanne,<sup>56</sup> that if life endured and opportunity was given he would next set to work as ordered by his patron, not only upon Haly's commentaries on the *Quadripartite* and *Almagest* of Ptolemy, but also upon a certain general commentary by Aristotle on the entire art of astrology.

The *Secret of Secrets* of the pseudo-Aristotle is immediately followed in one manuscript by chapters or treatises addressed to Alexander and entitled, *Of ideas and forms*, *Of the impression of forms*, and *Of images and rings*.<sup>57</sup> The theory, very like that of Alkindi, is maintained that "all forms are ruled by supercelestial forms through the spirits of the spheres" and that incantations and images receive their force from the spheres. The seven planets pass on these supercelestial ideas and forms to our inferior world. By selecting proper times for operating one can work good or ill by means of the rays and impressions of the planets. The scientific investigator who properly concentrates and fixes intent, desire, and appetite upon the desired goal can penetrate hidden secrets of secrets and occult science both universal and particular. The writer goes on to emphasize the importance of understanding all the different positions and relationships of the heavenly bodies and also the distribution of terrestrial objects under the planets. He then describes an astrological image which will cause men to reverence and obey you, will repel your enemies in terror, afflict the envious, send visions, and perform other marvelous and stupefying feats too numerous to mention.

<sup>55</sup> Digby 159, fol. 2r.

<sup>56</sup> Savile 15, fol. 205r.

<sup>57</sup> Bodleian 67 (Bernard 2136), 14th century, fol. 54r, *De ydeis et formis*; fol. 54v, *De impressione formarum*; fol. 56v, *De ymaginibus et annulis*. This last item, though noted in Bernard, is or was omitted in the proof sheets of the new Summary Catalogue of Bodleian MSS now in preparation.

As the *Speculum astronomiae* of Albertus Magnus listed a *Book of Judgments* by Aristotle among deserving works of astronomy and astrology, so in its list of evil books dealing with necromantic images appear a treatise by Hermes addressed to Aristotle and opening, "Aristotle said, 'You have seen me, O Hermes,'" and a treatise ascribed to Aristotle with the sinister title, *Death of the Soul*, opening, "Said Aristotle to King Alexander, 'If you want to perceive.'" This treatise the *Speculum* calls "the worst of all" the evil books on images. Roger Bacon, too, alludes to it by title as filled with figments of the Magicians, but does not name Aristotle as author.<sup>58</sup> Peter of Abano in his *Lucidator* follows the *Speculum astronomiae* in listing it among depraved, obscene, and detestable works.<sup>59</sup>

Alexander himself, as well as Aristotle, had some medieval reputation as an astrologer. In the tenth and eleventh century manuscripts of the *Mathematica* of Alhandreus, supreme astrologer, "Alexander of Macedon" was more than once cited as an authority, and there were also given "Excerpts from the books of Alexander, astrologer, king," and a "Letter of Argafalan to Alexander." Different from this, moreover, was the *Mathematica* of Alexander, supreme astrologer, found in a thirteenth century manuscript, in which from the movements of the planets through the signs one is instructed how to foretell prosperous and adverse journeys, abundance and poverty, misfortune or death of a friend, or to discover stolen articles, sorceries, buried treasure and so forth.<sup>60</sup> A treatise on seven herbs related to the seven planets is sometimes ascribed to Alexander,<sup>61</sup>

<sup>58</sup> Brewer (1859) p. 532, *De secretis*, cap. 3.

<sup>59</sup> BN 2598, fol. 101r, "liber quem Aristoteles attribuit Alexandro et quem nonnulli mortis intitulent anime."

<sup>60</sup> Ashmole 369, late 13th century, fols. 77-84v, "Mathematica Alexandri summi astrologi. In exordio omnis creature herus huranicus inter cuncta sidera xii maluit signa fore / nam quod lineam designat eandem stellam occupat. Explicit." Cap. x, de inveniendis de prospero aut adverso itinere; xi, de copia et paupertate; xiv, de nece aut casu amici; xvi, de latrocinio inveniendis; xxiv, de pecunia in terra defossa; xxxviii, de noscendis maleficiis.

<sup>61</sup> In the preface to the *Kiranides*; in Montpellier 277, 15th century; and in Ashmole 1448, 15th century, pp. 44-45, "Virtutes 7 herbarum a septem planetis secundum Alexandrum Imperatorem." It is also embodied in some editions and MSS of the *Liber aggregationis* or *Experimenta* attributed to Albertus Magnus, where it is entitled, "Virtutes herbarum septem secundum Alexandrum Imperatorem."

but perhaps more often to Flaccus Africanus, and at least once to Aristotle.<sup>62</sup>

The association of astrological images with spirits of the spheres in one of the above-mentioned works ascribed to Aristotle has already brought us to the border-line of our next topic, Aristotle and spirits. Under this caption may be placed a work found in a fifteenth century manuscript.<sup>63</sup> It also is in part astrological and is associated with the name of Hermes as well as of Aristotle. Its title runs, *The book of the spiritual works of Aristotle, or the book Antimaquis, which is the book of the secrets of Hermes: wonderful things can be accomplished by means of this book and 'tis the ancient book of the seven planets.* The treatise opens, "To every people and clime pertains a group of spirits." It then maps out these regions of different spirits in accordance with the planets and signs of the zodiac. Apparently this is the same work as that which Hunain ibn Ishak translated into Arabic and of which he says, "Among the works of Aristotle which we have found and translated from Greek into Arabic was *The book of the Causes of Spirituals* which has Hermes for author. . . . It is the book in which Aristotle treats of the causes of spirituals, talismans, the art of their operation, and how to hinder it, ordered after the seven climates."<sup>64</sup> It was probably some such spurious work that William of Auvergne had in mind when he spoke of Aristotle's boast that a spirit had descended unto him from the sphere of Venus.<sup>65</sup>

No genuine work of Aristotle on vegetables or minerals has come down to us to accompany his celebrated *History of Animals*, but supposititious writings were soon found by the Arabs to fill this gap. On plants a brief treatise by Nicolaus Damascenus passed for Aristotle's. Alfred of Sarchel translated it from Arabic into Latin,<sup>66</sup> presumably before the close of the twelfth

<sup>62</sup> Ashmole, 1741, late 14th century, fol. 143, "Incipiunt virtutes septem herbarum Aristotilis. Et has quidam virtutes habent ipse septem herbe ab ab influentia 7 planetarum. Nam contingit unamquamque recipere virtutem suam a superioribus naturaliter. Nam dicit Aristotelis quod corpora inferiora reguntur per superiora.

<sup>63</sup> Sloane 3854, 15th century, fols. 105v-110.

<sup>64</sup> E. Blochet, "Études sur le Gnosticisme musulman," in *Rivista degli studi orientali*, IV, 76.

<sup>65</sup> *De universo*, II, ii, 39 and 98; II, iii, 6.

<sup>66</sup> One MS is Harleian 3487, 14th century, No. 11.

century, since he dedicated it to Roger of Hereford, and Albertus Magnus expanded its two short books into seven long ones in his *De vegetabilibus et plantis*. There also existed in Arabic a *Lapidary* ascribed to Aristotle,<sup>67</sup> which was cited as early as the ninth century by Costa ben Luca. Ruska believes the work to be of Syrian and Persian origin,<sup>68</sup> although one Latin text professes to have been originally translated from Greek into Syriac.<sup>69</sup> Valentin Rose regarded it as the basis of all subsequent Arabic mineralogy, but found only two Latin manuscripts of it.<sup>70</sup> Albertus Magnus in his *Minerals* confesses that, although he had sought diligently in divers regions of the world, he had seen only excerpts from Aristotle's work. But another writer of the thirteenth century, Arnold of Saxony, cites translations of Aristotle on stones both by "Diascorides," which would seem sheer nonsense, and by Gerard, presumably of Cremona. Gerard's translation occurs in one of Rose's manuscripts; the other seems to give a version translated from the Hebrew.

In Gerard's translation, a work marked by puerile Latin style, the *Lapidary* of Aristotle is about equally devoted to marvelous properties of stones and tales of Alexander the Great. After some general discussion of stones and their wonderful properties, particular gems are taken up. The *gesha* brings misfortune. Its wearer sleeps poorly, has many worries, many altercations and law-suits. If it is hung about a boy's

<sup>67</sup> V. Rose, "Aristoteles de lapidibus und Arnoldus Saxo," in *Zeitschrift für deutsches Alterthum*, XVIII (1875) 321 et seq. More recently the *Lapidary* of Aristotle has been edited by J. Ruska, *Das Steinbuch des Aristoteles, nach der arabischen Handschrift*, Heidelberg, 1912, who gives both the Latin of the Liège MS and the text of the translation into Arabic by Luca ben Serapion from BN 2772, with a German translation of it.

<sup>68</sup> Ruska (1912) p. 43.

<sup>69</sup> Ibid. p. 183, "Et ego transfero ipsum ex greco sermone in ydyoma su(r)-orum vel Syrorum."

<sup>70</sup> Liège 77, 14th century; printed by Rose (1875) pp. 349-82.

Montpellier 277, 15th century, fol. 127-; printed by Rose (1875) pp. 384-97.

The following treatises, also ascribed to Aristotle, I have not examined: Sloane 2459, 15th century, fols. 9v-16, de proprietatibus herbarum et lapidum; Vienna 2301, 15th century, fols. 81-2, "Isti sunt lapides quorum virtutes misit Aristotiles in scriptis maximo imperatori Alexandro." Perhaps the last may have reference to philosopher's stones, like the similar treatise of Aristotle to Alexander noted above in our discussion of the pseudo-Aristotelian alchemical treatises.

neck, it makes him drivel. "There is great occult force" in the magnet, and instructions are given how to set water on fire with it. Several stones possess the property of neutralizing spells and counteracting the work of demons. With another stone the Indians make many incantations. Vultures were the first to discover the virtue of the stone *filcrum coarton* in hastening delivery. When a female vulture was near death from the eggs hardening in her body, the male flew off to India and brought back this stone which afforded instant relief. Another stone is so soporific that suspended about the neck it induces a sleep lasting three days and nights, and the effects of which are thrown off with difficulty even on the fourth day, when the sleeper will awake but act as if intoxicated and still seem sleepier than anyone else. Another stone prevents a horse from whinnying, if suspended from his neck.

Other gems suggest stories of Alexander. Near the frontier of India in a valley guarded by deadly serpents whose mere glance was fatal were many precious gems. Alexander disposed of the serpents by erecting mirrors in which they might stare themselves to death, and he then secured the gems by employing the carcasses of sheep in a manner already described by Epiphanius. A somewhat similar tale is told of Socrates by Albertus Magnus in his commentary on the pseudo-Aristotelian work on the properties of the elements and planets.<sup>71</sup> In the reign of Philip of Macedon, who is himself described as a philosopher and astronomer, the road between two mountains in Armenia became so poisoned that no one could pass. Philip vainly inquired the cause from his sages until Socrates came to the rescue and, by erecting a tower as high as the mountains with a steel mirror on top of it, saw two dragons polluting the air. The mere glance of these dragons was apparently not deadly, for men in air-tight armor went in and killed them. The same story is told by William of St. Cloud, who composed astronomical tables based upon his own observations from about 1285 to 1321, in which he detected errors in the earlier tables of Thebit, Toulouse, and Toledo.<sup>72</sup> In Peter of Abano's treatise on poi-

<sup>71</sup> *De causis elementorum*, etc., II, ii, 1 (Borgnet, IX, 643).

<sup>72</sup> *Histoire Littéraire de la France*, XXV, 65.



sons,<sup>73</sup> however, although he too cites the pseudo-Aristotle on the causes of the elements, the mirror has become a glass cave in which Socrates ensconces himself to observe the serpents. A *Lapidary* dedicated to King Wenzel II of Bohemia tells of Socrates' killing a dragon by use of quicksilver.<sup>74</sup> That Socrates also shared the medieval reputation of Aristotle and Plato for astrology and divination is seen from the *Prenostica Socratis Basilei*, a mode of divination found in the manuscripts.

Similar to Abano's tale of Socrates in the glass cave is the story told a century earlier by Alexander Neckam of Alexander himself. So sedulous an investigator of nature was the Macedonian, says Neckam, that he went down in a glass vessel to observe the natures and customs of the fishes. He would seem to have remained submerged for some time, since Neckam informs us that he took a cock with him in order to tell when it was dawn by the bird's crowing. This primitive submarine had at least a suggestion of war about it, since Neckam goes on to say that Alexander learned how to lay ambushes against the foe by observing one army of fishes attack another. Unfortunately, however, Alexander failed to commit to writing his observations, whether military or scientific, of deep-sea life; and Neckam grieves that very few data on the natures of fishes have come to his attention.<sup>75</sup>

Neckam's account differs a good deal from the story as told by the Arabian historian, Mas'ûdî, in the tenth century. There we read that, when Alexander was building the city of Alexandria, monsters came from the sea every night and overthrew the walls that had been built during the day. Night watchmen proved of no avail, so Alexander had a box made ten

<sup>73</sup> *De venenis*, ca. 5; probably written in 1316.

<sup>74</sup> Aristotle, *Lapidarius et Liber de physionomia*, Merszborg, 1473, p. 8.

<sup>75</sup> *De naturis rerum*, II, 21. In an illustrated 13th century MS of the vernacular Romance of Alexander three pictures are devoted to his submarine. CU Trinity 1446, 1250 A. D., fol. 27r, "Comment Alisandre vesqui suz les ewes; a covered ship with windows under green water, Alexander and three men in it; fol. 27v, Des nefz ke sont apelees colifas; a similar ship in the water, no one visible in it; Coment Alisandre encercha la nature de pessons; Alexander and two men in the ship, fish and mermaid below." I have quoted James' description of the MS (III, 488). See also the volume of Lacroix on Science and Literature in the Middle Ages, fig. 87, for a view of Alexander descending to the bottom of the sea in a glass cask, from a 13th century MS.

cubits long and five wide, with glass sides fastened into the frame work by means of pitch and resin. He then entered the box with two draughtsmen, who, after it had been let down to the bottom of the sea, made exact drawings of the monsters, who had human bodies but the heads of beasts. From these sketches Alexander had images constructed and placed on pillars, and these magic figures served to keep off the monsters until the city was completed. But the effect apparently began to wear off and talismans had to be added on the pillars to prevent the monsters from coming and devouring the inhabitants, as they had begun to do again.<sup>76</sup> Another Arab, Abu-Shâker, of the thirteenth century, repeats a current tradition that Aristotle gave Alexander a box of wax soldiers which were nailed, with inverted spears and swords and severed bow-strings, face-downwards in the box, which in its turn was fastened by a chain. As long as the box remained in Alexander's possession and he repeated the formulae which Aristotle taught him whenever he took the box up or put it down, he would triumph over his foes in war.<sup>77</sup> This reminds one of the methods of warfare employed by Alexander's fabled natural father, Nectanebus.

While we are speaking of military matters, it may be noted that in a manuscript of the thirteenth century which once belonged to an Albertus Bohemus or Beham, dean of the church at Padua and seems to have been his note-book, we find between the *Secret of Secrets* of the pseudo-Aristotle and a treatise on the significations of the moon in the signs "a delineation of a brazen horn made with marvelous art by which Alexander in time of war summoned his army from a distance of sixty miles."<sup>78</sup>

But to return to other tales of Alexander in the *Lapidary*. Once he saw afar enchanters and enchantresses who slew and wounded the men of his army by their diabolical power until Alexander prayed to God who revealed two stones which counter-acted the sorcery. On another occasion when by Alexander's order his barons had carried off certain gems, during the night following they suffered much insult from demons and were sore afraid, since sticks and stones were thrown about the camp by

<sup>76</sup> Budge, *Egyptian Magic*, 1899, pp. 152-6; Mas'ûdî, *Les Prairies d'Or*, ed. B. de Maynard and Pavet de Courteille, 1861, II, 425 ff.

<sup>77</sup> Budge (1899) pp. 95-6.

<sup>78</sup> CLM 2574b, bombyc. 13th century, fol. 69v.

unseen hands and men were beaten without knowing whence the blows came. It thus became apparent that the demons cherished those gems as their especial property and were accustomed to perform occult operations with them of which they did not wish men to learn the secret. Alexander found that these gems would protect him from any beast, serpent, or demon, although the nocturnal experience of his barons would scarcely seem to support this last point. On a third occasion his army were held motionless and gazed open-mouthed at certain stones, until a bird fluttered down and covered the gems with its outstretched wings. Then Alexander had his followers close their eyes and carry the stones away under cover and place them on top of the wall of one of his cities so that no one might scale the wall to spy upon the town.

Yet another curious story of Alexander and a stone is repeated by Peter of Abano in his work on poisons from a treatise "On the Nature of Serpents" which he ascribes to Aristotle. Alexander always wore a certain stone in his belt to give him good luck in his battles, but on his return from India, while bathing in the Euphrates, he removed the belt, whereupon a serpent suddenly appeared, bit the stone out of the belt, and vomited it into the river. Deprived of his talisman, Alexander presently met his death.<sup>79</sup>

Another *Lapidary*, printed as Aristotle's at Merseburg in 1473, is really a compilation of previous medieval works on the subject with the addition of some items derived from the personal knowledge or experience of the author. It was composed "to the honor of almighty God and the glory and perpetual memory of that virtuous and most glorious prince, Wenzel II, King of Bohemia" (1278-1305). As the treatise itself states,

<sup>79</sup> Very similar is the story in the Gilgamesh epic, a work "far more ancient than Genesis," of a serpent stealing a life-giving plant from Gilgamesh while he was bathing in a well or brook. The plant, which had been revealed to Gilgamesh by the deified Ut-napishtim, "had the miraculous power of renewing youth and bore the name 'the old man becomes young.' " Sir James Frazer (*Folk-Lore in the Old Testament*, 1918, I, 50-51) follows Rabbi Julian Morgenstern ("On Gilgamesh-Epic, XI, 274-320," in *Zeitschrift f. Assyriologie*, XXIX, 1915, p. 284 ff.) in connecting this incident with the serpent and tree of life in the Biblical account of the fall of man, and gives further examples from the folklore of primitive peoples of other jealous animals, such as the dog, frog, duck, and lizard, perverting divine good tidings or gifts to man to their own profit.

"the Lapidary of Aristotle in the recent translation from the Greek" is only one of its sources along with Avicenna, Constantinus Africanus, Albertus Magnus, and others.

Another work which claims Aristotelian authorship only in its title is the *Chiromancy of Aristotle*, printed at Ulm in 1490, which quotes freely from Albertus Magnus and Avicenna. There are also brief tracts on chiromancy ascribed to Aristotle in manuscripts of the thirteenth or fourteenth century,<sup>80</sup> Forster has identified Polemon as the author of the Greek treatise on physiognomy ascribed to Aristotle.<sup>81</sup> The art of physiognomy of course professed to read character from the face or other parts of the body, and chiromancy which we have just mentioned is really a branch of it. In Latin translation the treatise was accepted as Aristotle's by such medieval schoolmen as Albertus Magnus and Duns Scotus. There are many manuscripts of it in the British Museum, including one which perhaps dates back to the twelfth century.<sup>82</sup> Its popularity continued long after the invention of printing, as is shown by separate editions of it brought out at Paris in 1535 and at Wittenberg in 1538, and by commentaries upon it<sup>83</sup> published at Paris in 1611, at Bologna in 1621, and at Toulouse in 1636. Besides such separate manuscripts and editions of it, it was also regularly embodied in the numerous copies of the pseudo-Aristotelian work to which we next turn.

Most widely influential upon the medieval mind of all the spurious works attributed to Aristotle was the *Secret of Secrets*. Förster enumerated two hundred and seven Latin manuscripts of it and his list is probably far from complete.<sup>84</sup> Gaster calls it

<sup>80</sup> Sloane 2030, fols. 125-26; Additional 15236, fols. 154-60: BN, 7420A (14th century) No. 16.

<sup>81</sup> Richard Förster, *De Aristotelis quae feruntur physiognomonicis recensendis*, Kiliae, 1882; *De transl. latin. physiognom.*, Kiliae, 1884; *Scriptores Physiognomici* Lipsiae, 1893-1894.

<sup>82</sup> Cotton Julius D-viii, fol. 126 ff.; Harleian 3969; Egerton 847; Sloane 2030, fol. 95-103; Additional 15236, fol. 160 (in abbreviated form); Sloane 3281, fols. 19-23; Sloane 3584; Egerton 2852, fol. 115v. et seq.

<sup>83</sup> There is a manuscript copy of a commentary on it of the fourteenth century at Erfurt, Amplon. Quarto 186. See Schum's catalog for MSS. of the *Physiognomia* itself in the Amplonian collection.

<sup>84</sup> R. Förster, *De Aristotelis quae feruntur secreta secretorum Commentatio*, Kiliae, 1888; Handschriften und Ausgaben des pseudo-Aristotelischen *Secretum secretorum*, in *Centralblatt f. Bibliothekswesen*, VI (1889) 1-22, 57-76.

"The most popular book of the middle ages.<sup>85</sup> This is not surprising since it purports to sum up in concise form what the greatest of ancient philosophers deemed it essential for the greatest of ancient rulers to know, and since under the alluring pretense of revealing great secrets in parable and riddle it really masses together a number of the best-tested and most often repeated maxims of personal hygiene and practical philosophy, and some of the superstitious to which men have shown themselves most inclined. Every European library of consequence contains a number of copies of it. It was translated into almost every European language and was often versified, as in Lydgate's and Burgh's *Secrees of old Philisoffres*.<sup>86</sup> Albertus Magnus cited it as Aristotle's;<sup>87</sup> Roger Bacon wrote a rather jejune commentary upon it.<sup>88</sup> It was printed a number of times before 1500.<sup>89</sup>

<sup>85</sup> M. Gaster, in his Introduction to a Hebrew version of the Secret of Secrets, in the *Journal of the Royal Asiatic Society*, (1908, part 2), pp. 1065-84; for the Hebrew text and an English translation, *Ibid.* (1907) pp. 879-913 and (1908, part 1) pp. 111-62.

<sup>86</sup> Ed. Robert Steele, EETS LXVI, London, 1894. Volume LXXIV contains three earlier English versions. There are numerous MSS of it in Italian in the Riccardian and Palatini collections at Florence.

<sup>87</sup> *De somno et vigilia*, I, ii, 7.

<sup>88</sup> Tanner 116, 13th century; Corpus Christi 149, 15th century. Recently edited, together with Bacon's peculiar arrangement of the text, by Robert Steele, 1902, as Fasc. V of his *Opera hactenus inedita Rogeri Baconi*.

<sup>89</sup> There are considerable discrepancies between the different early printed editions, which differ in length, order of arrangement, tables of contents, and number of chapters. And in the same edition the chapter headings given in the course of the text may not agree with those in the table of contents, which as a rule, even in the MSS, does not fully cover the subject-matter of the text. The different printers have probably used different manuscripts for their editions rather than made any new additions of their own. The following editions are those to which references will be made in the following pages.

An edition printed at Cologne about 1480, which I examined at the Harvard University Library, divides the text into only thirty chapters and seems imperfect.

An edition of about 1485, which I examined at the British Museum, where it was numbered IA.10756, has 74 chapters, and the headings of its 25th and 30th chapters, for instance, agree with those of the 11th and 13th chapters in the Harvard copy.

A third edition of Paris, 1520 has no numbered chapters and contains passages not found in the two earlier editions.

As a check upon these printed texts I have examined the three following MSS, two of the 13th, and one of the 14th century. Of these Egerton 2676

The *Secret of Secrets* is believed to be the outcome of a gradual process of compilation from very varied sources, and to have reached something like its present form by the seventh or eighth century of our era. But its chapters on physiognomy, as we have seen, go back to Polemon's treatise, and part of its medical discussion is said to be borrowed from Diocles Caristes who wrote about 320 B.C. Some Graeco-Persian treatise is thought to be the basis of its discussion of kingship. It is also believed to have appropriated bits from popular literature to its own uses. In Arabic there is extant both a longer and a shorter version, and Gaster has edited a Hebrew text which is apparently derived from a different Arabic original than any Latin text. The process of successive compilation, or at least, re-editing and repeated translation which the work underwent is suggested by a series of prologues which occur at the beginning. Following the preface of the Latin translator and the table of contents comes what is called "the prologue of a certain doctor in commendation of Aristotle,"<sup>90</sup> in which omnipotent God is prayed to guard the king and some anonymous editor states that he has executed the mandate enjoined upon him to procure the moral work on royal conduct called *The Secret of Secrets*, which Aristotle, chief of philosophers, composed. After some talk about Aristotle and Alexander a second prologue begins with the sentence, "John who translated this book, son of a patrician, most skilful and faithful interpreter of languages, says." This John appears to have been Yuhanna ibn el-Batriq and what he says is that he searched the world over until he came to an oracle of the sun which Esculapides had constructed. There he found a solitary abstemious sage who

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corresponds fairly closely throughout to the edition numbered IA.10756 in the British Museum.

Egerton 2676, 13th century, fols. 3-52

BN 6584, 13th century, fols. 1r-32v

Bodleian 67, 14th century, fols. 1-53v, is much like the preceding MS.

<sup>90</sup> BN 6584, fol. 1v, "De prologo cuiusdam doctoris in commendatione aristotelis." See also Digby 228, 14th century, fol. 27, where a scribe has written in the upper margin, "In isto libello primo ponitur prologus, deinde tabula contentorum in libro, deinde prologus cuiusdam doctoris in commendationem Aristotelis, deinde prologus Iohannis qui transtulit librum istum. . . ." In Egerton 2676, fol. 6r, "Deus omnipotens custodiat regem. . . ."

presented him with this book which he translated from Greek into Chaldaic and thence into Arabic. This passage reminds one of Harpocraton's prefatory remarks to his daughter in the *Kiranides*; indeed, it is quite in the usual style of apocryphal writings.

In the matter of the Latin translation we are on somewhat more certain ground. John of Spain in the first half of the twelfth century seems to have translated only the medical portion.<sup>91</sup> Manuscripts of this partial translation are relatively few,<sup>92</sup> and it was presently superseded by the complete translation made either in the twelfth or early thirteenth century<sup>93</sup> by Philip, "the least of his clerics" for "his most excellent lord, most strenuous in the cult of the Christian religion, Guido of Valencia, glorious pontiff of the city of Tripoli." Philip goes on to say in his dedicatory preface that it was when he was with Guido in Antioch that they found "this pearl of philosophy, . . . this book which contains something useful about almost every science," and which it pleased Guido to have translated from Arabic into Latin. Although the various printed editions and manuscripts of the *Secret of Secrets* in Latin vary considerably, they regularly are preceded by this ascription of the Latin translation to Philip, and usually by the other prologues aforementioned. Who this Philip was, other than a cleric of Tripoli, is still undetermined. If he was the same as the papal physician whom Alexander III in 1177 proposed to send on a mission to Prester John, he had probably made his translation before that date. J. Wood Brown would identify him with Philip of Salerno,

<sup>91</sup> Steinschneider (1905) p. 42, it is true, says, "Ob Joh. selbst das ganze Secretum übersetzt habe, ist noch nicht ermittelt;" but the following passage, cited by Giacosa (1901) p. 386 from Bibl. Angelica Rome, Cod. 1481, 12th century, fols. 144-146v, indicates that he translated only the medical part.

"Cum de utilitate corporis olim tractarim et a me quasi essem medicus vestra nobilitas quereretur ut brevem libellum et de observatione diete et de continentia cordis in qualibus se debent contineri qui sanitatem corporis cupiunt servare accidit ut dum cogitarem vestre iussioni obedire huius rei exemplar aristotelis philosophi Alexandro dictum repente in mente occurreret quod excerpti de libro qui arabice vocatur ciralacerar id est secretum secretorum que fecit fieri predictus Aristotelis philosophus Alexandro regi magno de dispositione regni in quo continentur multa regibus utilia. . . ."

<sup>92</sup> Ed. H. Souchier, *Denkmäler provenzal Lit.*, Halle, 1883, I, 473 et seq.

<sup>93</sup> Thirteenth century MSS of Philip's translation are numerous: I have not noted a 12th century one.

a royal notary whose name appears in 1200 on deeds in the kingdom of Sicily.<sup>94</sup>

Returning to Philip's preface to Guido, it may be noted that he states that Latins do not have the work and it is rare among the Arabs.<sup>95</sup> His translation is a free one since the Arabic idiom is different from the Latin. Aristotle wrote this book in response to the petition of King Alexander his disciple who demanded that Aristotle should either come to him or faithfully reveal the secrets of certain arts, namely, the motion, operation, and power of the stars in astronomy, the art of alchemy, the art of knowing natures and working enchantments, and the art of geomancy. Aristotle was too old to come in person, and although it had been his intention to conceal in every way the secrets of the said sciences, yet he did not venture to contradict the will and command of so great a lord. He hid some matters, however, under enigmas and figurative locutions. For Alexander's convenience he divided the work into ten books, each of which is divided into chapters and headings. Philip adds that for his readers' convenience he has collected these headings at the beginning of the work and a table of contents follows.<sup>95a</sup> Then come the two older prologues which we have already described, next a letter of Aristotle to Alexander on the extrinsic and intrinsic

<sup>94</sup> Brown (1897) pp. 19-20, 36-7. But not much reliance can be placed on the inclusion of this name "Master Philip of Tripoli" in a title which Brown (p. 20) quotes from a De Rossi MS, "The Book of the Inspections of Urine according to the opinion of the Masters, Peter of Berenico, Constantine Damascenus, and Julius of Salerno; which was composed by command of the Emperor Frederick, Anno Domini 1212, in the month of February, and was revised by Master Philip of Tripoli and Master Gerard of Cremona at the orders of the King of Spain" etc., since Gerard of Cremona at least had died in 1187 and there was no "king of Spain" until 1479.

Brown does not give the Latin for the passage, but if the date 1212 could be regarded as Spanish era and turned into 1174 A.D., Gerard of Cremona would still be living, the emperor would be Frederick Barbarossa instead of Frederick II, and Master Philip of Tripoli might be the same Philip whom Pope Alexander III proposed to send to Prester John in 1177.

<sup>95</sup> BN 6584, fol. 1r, "Hunc librum quo carebant latini eo quod apud paucissimos arabes reperitur transtuli cum magno labore. . . ." A considerable portion of Philip's preface is omitted in the Harvard edition.

<sup>95a</sup> The preliminary table of contents, however, gives only chapter headings, which in BN 6584 are 82 in number, but the beginnings of the ten books are indicated in the text in BN 6584 as follows. The numbers in parentheses



sis causes of his work,<sup>96</sup> and then with a chapter which is usually headed *Distinctio regum* or *Reges sunt quatuor* begins the discussion of kingship which is the backbone of the work.

It is evident from Philip's preface that occult science also forms a leading feature in the work as known to him. Gaster, who contended that the Hebrew translation from the Arabic which he edited was as old as either John of Spain's or Philip's Latin translations, although the oldest of the four manuscripts which he collated for his text is dated only in 1382 A.D., made a rather misleading statement when he affirmed, "Of the astrology looming so largely in the later European recensions the Hebrew has only a faint trace."<sup>97</sup> As a matter of fact some of the printed editions contain less astrology than the thirteenth century manuscripts, while Gaster's Hebrew version has much more than "a faint trace" of astrology. But more of this later.

On the other hand, I cannot fully subscribe to Steinschneider's characterization of *The Secret of Secrets* as "a wretched compilation of philosophical mysticism and varied superstition."<sup>98</sup> Of superstition there is a great deal, but of philosophical mysticism there is practically none. Despite the title and the promise in Philip's preface of enigmatic and figurative language, the tone of the text is seldom mystical, and its philosophy is of a very practical sort.

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are the corresponding leaves in Bodleian 67 which, however, omits mention of the book and its number except in the case of the fourth book.

fol. 3v(5r), Incipit liber primus. Epistola ad Alexandrum

fol. 6r, Secundus liber de dispositione Regali et reverentia Regis

Fol. 12r (18v), Incipit liber tertius. Cum hoc corpus corruptibile sit eique accidit corruptio. . . .

fol. 22r (36r), Incipit liber quartus. transtulit magister philippus tripolitanus de forma iusticie

fol. 28r (44v), Liber Quintus de scribis et scriptoribus secretorum

fol. 28r (45r), Liber Sextus de nuntiis et informationibus ipsorum

fol. 28v (46v), Liber Septimus de hiis qui sr' intendunt et habent curam subditorum

fol. 29r (47r), Liber Octavus de dispositione ductoris sui et de electione belatorum et procerum inferiores.

fol. 29v (48r), Liber Nonus de regimine bellatorum et forma aggrediendi bellum et pronatationibus eorundem

fol. 30v (50v), Sermo de phisionomia cuiuslibet hominis.

<sup>96</sup> It is omitted in some printed editions but occurs in both 13th century MSS which I examined.

<sup>97</sup> Gaster (1908) p. 1076.

<sup>98</sup> Steinschneider (1905) p. 60.

Nor can *The Secret of Secrets* be dismissed as merely "a wretched compilation." Those portions which deal with kingcraft and government display shrewdness and common sense, worldly wisdom and knowledge of human nature, are not restricted by being written from any one premise or view-point, and often evince real enlightenment. Those historians who have declared the love of fame a new product of the Italian Renaissance should have read the chapter on fame in this most popular book of the middle ages, where we find such statements as that royal power ought not to be desired for its own sake but for the sole purpose of achieving fame. Other noteworthy utterances indicative of the tone and thought of the book are that "the intellect . . . is the root of all things praiseworthy"; that kings should cultivate the sciences; that liberality involves respect for other's property; that "war destroys order and devastates the lands and turns everything to chaos"; that no earthly ruler should shed blood, which is reserved for God alone, but limit his punishments to imprisonment, flogging, and torture; that the king, as Chief Justice Coke later told James I, is under the law; that taxes upon merchants should be light so that they will remain in the country and contribute to its prosperity; that his people are a king's true treasury and that he should acquaint himself with their needs and watch over their interests.

From the medical passages of the book one would infer that the art of healing at first developed more slowly than the art of ruling in the world's history. The medical theory of the *Secret of Secrets* is not of an advanced or complex sort, but is a combination of curious notions such as that vomiting once a month is beneficial and sensible ideas such as that life consists of natural heat and that it is very important to keep the abdomen warm and the bowels moving regularly. The well-known apothegm of Hippocrates is quoted, "I would rather eat to live than live to eat."

Much of the advice offered to Alexander by Aristotle in *The Secret of Secrets* is astrological. Among those studies which the king should promote the only one specifically mentioned is astrology, which considered "the course of the year and of the stars, the coming festivals and solemnities of the month, the course of the planets, the cause of the shortening and lengthening of days and nights, the signs of the stars which determine the future and many other things which pertain to prediction of

the future.<sup>99</sup> Alexander is adjured "not to rise up or sit down or eat or drink or do anything without consulting a man skilled in the art of astronomy."<sup>100</sup> Later the two parts of astronomy are distinguished, that is astronomy and astrology in our sense of the words. Alexander is further warned to put no faith in the utterances of those stupid persons who declare that the science of the stars is too difficult to master. No less stupid is the argument of others who affirm that God has foreseen and foreordained everything from eternity and that consequently all things happen of necessity and it is therefore of no advantage to predict events which cannot be avoided. For even if things happened of necessity, it would be easier to bear them by foreknowing and preparing for them beforehand, just as men make preparations against the coming of a cold winter—the familiar contention of Ptolemy. But *The Secret of Secrets* also believes that one should pray God in his mercy to avert future evils and ordain otherwise, "For He has not so ordained things that to ordain otherwise derogates in any respect from his Providence" But this is not so approved an astrological doctrine. Later in the work Alexander is once more urged never to take medicine or open a vein except with the approval of his astronomers,<sup>101</sup> and directions are given as to the constellations under which bleeding should be performed and also concerning the taking of laxatives with reference to the position of the moon in the signs of the zodiac.<sup>102</sup> Later the work discusses the relations of the four elements and of various herbs to the seven planets,<sup>103</sup> and in the next to last chapter Alexander is advised to conduct his wars under the guidance of astrology.<sup>104</sup>

<sup>99</sup> Cap. 11 (Harvard copy); cap. 25 (BM. IA.10756); Egerton 2676, fol. 12r; BN 6584, fol. 9v.

<sup>100</sup> Cap. 13 (Harvard copy); cap. 30 (BM. IA.10756); Egerton 2676, fol. 13r; BN 6584, fol. 10r; also in Gaster's Hebrew text.

<sup>101</sup> Egerton 2676, fol. 32r.; cap. 62 (BM. IA.10756); fol. xxxiiir. (Paris, 1520). BN 6584, fol. 19v.

<sup>102</sup> The Paris, 1520 edition then goes on to explain the effects of incantations and images upon astrological grounds, but this passage seems to be missing from the earlier printed editions and the thirteenth century manuscripts. Roger Bacon, however, implies that incantations were present in Philip's original translation: Steele (1920) 258–9.

<sup>103</sup> This passage is found both in Egerton MS. 2676 and in BM. IA.10756. BN 6584, fol. 21r-v. Bodl. 67, fol. 32v-35v.

<sup>104</sup> Cap. 73 (BM. IA.10756); fols. 44v-45r. (Paris, 1520). BN 6584, fol. 30v.

There is much indulging in astrological theory in the midst of the chapter on Justice, and the constitution of the universe is set forth from the first and highest simple spiritual substance down through the nine heavens and spheres to the lowest inferiors. To illustrate the power of the stars the story is presently told of two boys,<sup>105</sup> one a weaver's son, the other a royal prince of India. Sages who were chance guests in the weaver's house at the time of the child's birth noted that his horoscope was that of a courtier high in royal councils but kept their discovery to themselves. The boy's parents vainly tried to make a weaver of him, but even beatings were in vain; he was finally allowed to follow his natural inclination, secured an education, and became in time a royal governor. The king's son, on the contrary, despite his royal birth and the fact that his father sent him through all his provinces to learn the sciences, would take no interest in anything except mechanics conformably to his horoscope.

In *The Secret of Secrets* the pseudo-Aristotle refers Alexander for the virtues of gems and herbs to his treatises on stones and plants, presumably those which we have already described. He does not entirely refrain from discussion of such marvelous properties in the present work, however, mentioning the use of the virtues of stones in connection with incantations. We also again hear of stones which will prevent any army from withstanding Alexander or which will cause horses to whinny or keep them from doing so; and of herbs which bring true or false dreams or cause joy, love, hate, honor, reverence, courage, and inertia.<sup>106</sup> One recipe reads, "If you take in the name of someone seven grains of the seeds of the herb called androsimon, and hold them in his name when Lucifer and Venus are rising so that their rays touch him (or them?), and if you give him those seven grains to eat or pulverized in drink, fear of you will ever abide in his heart and he will obey you for the rest of his life."<sup>107</sup> Astrological images are discussed at least in some versions.<sup>108</sup>

The extreme powers attributed to herbs and stones in *The Secret of Secrets* aroused some skepticism among its Latin readers

<sup>105</sup> BN 6584, fol. 21r; also in Gaster's Hebrew version; cap. 26 in the Harvard copy.

<sup>106</sup> Gaster, pp. 116, 160-62; Egerton 2676, fols. 34r-35r; cap. 66 (BM. IA.10756); fol. 37v. (Paris, 1520). BN 6584, fol. 20r-22r.

<sup>107</sup> Egerton 2676, fol. 36v; BN 6584, fol. 22r.

<sup>108</sup> Paris (1520) fol. 37; Steele (1920) lxii, 157-63, 252-61; Gaster, p. 159.

of the thirteenth century.<sup>109</sup> Geoffrey of Waterford, a Dominican from Ireland who died about 1300, translated *The Secret of Secrets* into French. He criticized, however, its assertions concerning the virtues of stones and herbs as more akin to fables than to philosophy, a fact of which, he adds, all clerks who know Latin well are aware. He wonders why Alexander had to win his battles by hard fighting when Aristotle is supposed to inform him in this book of a stone which will always rout the enemy. Geoffrey decides that such false statements are the work of the translators and that Aristotle is the author only of what is well said or reasonable in the work.

Something is said in *The Secret of Secrets* of the occult properties and relative perfection of numbers, and as usual the preference is for the numbers, three, four, seven, and ten.<sup>110</sup> The Hebrew version adds a puerile method of divining who will be victor in a battle by a numerical calculation based upon the letters in the names of the generals. The treatment of alchemy is rather confusing and inconsistent. A recipe for the Philosopher's stone is given, but in some versions Alexander is warned that *Chimia* or *Kimia* is not a true science.<sup>111</sup>

We may conclude our picture of the work's contents with two of its stories, namely, concerning the poisonous maiden and the Jew and the Magus. A beautiful maiden was sent from India to Alexander with other rich gifts. But she had been fed upon poison from infancy "until she was of the nature of a snake. And had I not perceived it," continues Aristotle in the Hebrew version, "for I suspected the clever men of those countries and their craft, and had I not found by tests that she would kill thee by her embrace and by her perspiration, she surely would have killed thee."<sup>112</sup> This venomous maiden is also alluded

<sup>109</sup> HL. XXI, 216 ff.

<sup>110</sup> Caps. 68 and 72 (BM. IA.10756); cap. 68 appears in Egerton 2676; cap. 72 in Gaster's text and in the Paris (1520) edition. I could not find the passage in BN 6584.

<sup>111</sup> BN 6584, fol. 20r-v; Egerton 2676, fol. 33v-34r.; cap. 65 (BM. IA. 10756); fols. 36v.-37r., and fol. 38r. (Paris, 1520); Gaster, 159-60. The warning against alchemy does not appear in the two 13th century MSS but only the printed edition of 1520 and Gaster's Hebrew version.

<sup>112</sup> Gaster, p. 127; cap. 12 (Harvard copy); also in BM. IA.10756, and BN 6584, fol. 10r, where Aristotle seems to detect the venomous nature of the maiden by magic art—"Et nisi ego illa hora sagaciter inspexissem in ipsam et arte magica iudicassem. . ."; while it is her mere bite that kills men, as Alexander afterwards proved experimentally.

to in various medieval discussions of poisons. Peter of Abano mentions her in his *De venenis*.<sup>113</sup> Gilbert of England, following no doubt Gerard of Cremona's translation of Avicenna, cites Ruffus rather than the Pseudo-Aristotle concerning her and says nothing of her relations to Alexander, but adds that animals who approached her spittle were killed by it.<sup>114</sup> In "Le Secret aux philosophes," a French work of the closing thirteenth century, where the story is told at considerable length, Socrates rather than Aristotle saves Alexander from the poisonous maid.<sup>115</sup>

In the other story a Magus is represented in a much more favorable light than magicians generally were; he seems to represent rather one of the Persian sages. He was traveling on a mule with provisions and met a Jew traveling on foot. Their talk soon turned to their respective religions and moral standards. The Magus professed altruism; the Jew was inclined to get the better of all men except Jews. When these principles had been stated, the Jew requested the Magus, since he professed to observe the law of love, to dismount and let him ride the mule. No sooner had this been done than the Jew, true to his law of selfishness and hate, made off with both mule and provisions. This misfortune did not lead the Magus to lose his faith in God, however, and as he plodded along he by and by came again upon the Jew who had fallen off the mule and broken his neck. The Magus then mercifully brought the Jew to the nearest town where he died, while the king of the country made the Magus one of his trusted ministers of state.<sup>115</sup>

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<sup>113</sup> Cap. 3.

<sup>114</sup> Gilbertus Anglicus, *Compendium medicinae*, Lyons, 1510, fol. 348v.

<sup>115</sup> HL. XXX, 569 ff. "*Die Sage vom Giftmädchen*" is the theme of a long monograph by W. Hertz, *Gesammelte Abhandlungen* (1905) pp. 156-277.

<sup>116</sup> BN 6584, fol. 27; IA. 10756, cap. 68; also in Paris, 1520 edition, etc. The various writers of the twelfth and thirteenth centuries who have been cited in this article, and the whole subject of medieval occult science, will be treated of more fully in my *History of Magic and Experimental Science and their Relation to Christian Thought during the first thirteen centuries of our era*, which is now in press.

The Historical Background of Modern Science

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## THE HISTORICAL BACKGROUND OF MODERN SCIENCE<sup>1</sup>

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### THE NEED OF STARTING RIGHT IN THE HISTORY OF SCIENCE

THE history of science is practically a new field both for the scientist and the historian, and so, like a spotless sheet of white paper or an untrodden expanse of glistening snow, is a very tempting thing upon which to make marks or tracks, and I have to confess to being one of those who have been unable to resist this temptation. But it would obviously be advantageous if we could use this opportunity to open up a new field by opening it up in the right and best way, and not indulge in tentative activities of a kind which will only handicap and mislead those who follow us. The investigation of this new field should at least be up to date in availing itself of the latest achievements and most advanced methods both of historical scholarship and scientific research. Such a joint conference as this, then, where scientists and historians may take counsel together, seems a very fitting occasion for discussing what are the best methods of attack in dealing with the history of science. My acquaintance is limited for the most part to what may seem at first sight the remote historical background of the so-called middle ages and beyond; but inasmuch as only about one millionth part of the whole evolutionary process of this world and life therein has been added since the close of the middle ages—and when did they close, anyway?—perhaps I may bring to you from the study of that period, which is thus in reality very close and near to us, some warnings and suggestions.

### THE HISTORY OF SCIENCE SHOULD BE STUDIED SCIENTIFICALLY

Historians owe a great debt to the natural and exact sciences for the conception of a science of history. Although some historians maintain that such a science of history is impossible because we can not experiment with the past and because the extant

<sup>1</sup> An address delivered at the joint session of Section L, American Association for the Advancement of Science, with the History of Science group from the American Historical Association, Thursday, December 28, 1922, at Cambridge, Massachusetts.



remains are so fragmentary, and that therefore they are at liberty to reconstruct or imagine the past as they please, the majority of historical workers feel that these considerations only make doubly important the very thorough gathering and exceedingly careful and accurate measurement and interpretation of such materials as we do have. We feel the need as much as or even more than you of thorough scientific training, equipment and scepticism. We have to use the microscope of minutely sensitive critical insight, the balances of delicately suspended judgment and absolutely dispassionate appraisal. I say this because it has seemed to me that sometimes scientists, when they first enter the historical field, tend to kick up their heels, be exuberant in their new-found pasture, and follow the example of certain historians who run snorting around at large instead of yoking themselves to the heavy plough of scientific historical method and drawing a straight furrow. The history of science must be studied scientifically. One must no more follow authority than one would in the laboratory. One must accept only such scientifically demonstrated results as one would in a scientific paper after testing them further for oneself. As the laboratory equipment and method of the sciences are but a thing of yesterday, so great caution is required in using the history books of a previous generation. And in a subject so full of uncertainties and marked by relativity as is history, one must hesitate long before selecting this or that factor or personage for special emphasis.

#### RELATION OF THE HISTORY OF SCIENCE TO THE HISTORY OF CIVILIZATION

Most of us will probably agree that history in the narrow sense, as presented and covered in courses given hitherto by the departments of history in most of our institutions of learning, has little vital connection with the history of science which relates rather to the history of civilization. I will not stop to define this phrase, "history of civilization," as I think all of us here are in fundamental agreement as to what constitutes civilization. I find myself, for example, interested in almost exactly those same books on, and sides of, civilization other than science proper which Dr. Sartori includes for consideration in the pages of "Isis." It is true that books have been published recently with civilization in their titles which in substance are still mainly repetitions of the old political and military history. But the mere change in title is significant of a change in interest, and the main reason why these recent books do not make their contents conform better to their covers is that their authors did not possess the broad appreciation

or patient industry to collect the necessary new material for a true history of civilization. Indeed, any philosophy of the progress of civilization, adequately supported by detailed researches and acceptable in its general outline to common sense, is as yet as much in its infancy as is the history of science itself. And very naturally so; for how can the history of civilization be adequately comprehended when the history of science remains so largely unknown? The history of art has recently received the attention of many specialists and publications and made rapid forward strides; the histories of literature and philosophy made their debut still earlier; but even these departments of the history of civilization will be incomplete until the true relations of the science of the past to them is made more clear.

#### THE DANGER OF SWEEPING GENERALIZATIONS

Indeed, almost all histories of art, literature and philosophy that I have read, however scholarly they may have been in their own special spheres, have shown a weakness not merely in regard to the scientific knowledge of the past but also in regard to the main current of history and civilization. Briefly, they have said and assumed too much, and, instead of sensing the relativity of history, have indulged in unwarranted generalizations. For instance, they speak with altogether too much confidence concerning "the spirit" of any age in question. Yet the spirit of any age would seem almost its most elusive feature; the most difficult to capture, define and measure; rightly to be estimated only after all the facts are in and have been carefully weighed and classified; and furthermore, unfortunately, the one point on which rhetorical and impressionistic but not overscrupulous historians or word-painters of the past have been most likely to give vent to unrestrained imagination. The ordinary reader accepts eagerly these easy generalizations and such brief catch-words to describe whole periods as Renaissance, Scholasticism, Medievalism, Reformation, Age of Reason, Modern Progress. But they are rather more misleading than convenient, and to the trained eye usually betray a lack of detailed acquaintance upon the part of their users. Certainly the fitness of such rough designations has never been scientifically demonstrated, and they must not be taken as axiomatic. On the contrary, most recent detailed research has tended to disprove them, except—and here comes the pity of it—in those numerous cases where it has unquestioningly based its further painstaking investigation of minor points upon this false foundation of sweeping generality. The very notion that history falls into periods violates the great law of historical continuity, as Professor James

Harvey Robinson was pointing out when I began graduate work in history twenty years ago; but while almost every one agrees to this now, almost every one also still continues—thereby admirably illustrating the law of historical continuity itself—to assume the periods as a basis of classification, argumentation and generalization, and I somewhat regret to note that even you scientists, despite your faith in gradual and unceasing evolution, keep presenting us with additional periods, Pre-Chellean, Mousterian, Aurignacian, Solutrean, Magdalenian and what not.

#### HISTORY OF CIVILIZATION HAS NOT YET BEEN FULLY INVESTIGATED

Another reason why we do not yet have a complete notion of the course of civilization in general, against which we may set the history of science in particular, is that the early history of mankind and of the ancient civilization of the near east has only recently been brought to light, while China and India have scarcely been taken into account in our western efforts to trace the evolution of human civilization. Yet their long unbroken development, their voluminous literatures, assuredly furnish most illuminating illustration all along the line—parallel cases or contradictory cases as the case may be—and must be included before we shall have a satisfactory synthesis. It would, therefore, seem the part of discretion for the historian of science to refrain for the present from all sweeping generalizations concerning such matters as the spirit of an age or the character of civilization at large, and above all not to take such generalizations from antiquated authorities or from books that never were authoritative, but rather limit himself strictly to what scientists were doing and thinking in the past, and thus supply a true foundation for a later unprejudiced synthesis.

#### INNER MENTAL DEVELOPMENT MORE IMPORTANT THAN OUTWARD CIRCUMSTANCE

In any case has not the history of science through the ages depended more upon the development of the scientific mind than upon outward circumstances? Superstition and folklore, magical practice and belief, divination of the future, do not appear to have been forced upon man by outward circumstances but to be an inevitable stage in the development of the human mind, though of course they may come to be sanctioned and maintained by society. The same would seem true of science itself. On the other hand, war and cruelty, persecution or neglect of unusual individuals—persecution is preferable as an advertising medium to neglect—and intolerance in one form or another have been pretty much a constant quantity in all ages of human civilization thus far; and

when the historian dwells upon them inordinately in any one period, it is apt to be a case of hypocritical indication of a mote in another's eye when he might better be employed in removing a beam from his own. We, who invent poisonous and deadly gases to slaughter mankind wholesale, hold up our hands in horror at the more discriminating activities of the Holy Inquisition, which as a matter of fact very seldom persecuted any one for scientific views, but medieval church councils forbade the use of military engines against Christians as being too murderous and perhaps kept Greek fire out of western Europe, therein displaying a medieval prejudice against inhuman war inventions which two nineteenth century historians of artillery somewhat impatiently ascribe to "ignorance, religion and chivalry."

THE CONFLICT OF SCIENCE AND RELIGION HAS BEEN TOO MUCH  
DWELT UPON

It would indeed be well if historians of science from now on could forget a little—if Mr. Bryan and Kentucky legislators will let them forget—the concept of a conflict between science and religion. I do not mean to say that there has not been a conflict and that it is not still irritating, but it does seem to me that it has been overemphasized and is not the *leit motiv* of the entire history of science or of the history of science since the beginning of Christianity. Pagan Antiquity persecuted its scientists more than the Middle Ages did theirs. And Mr. Bryan is not a relic of medievalism as this morning's paper says someone intimated at these conferences yesterday. Mr. Bryan is a distinctive product of our modern civilization. There are many other things that have conflicted and still conflict with science besides religion, and an unscientific attitude is displayed in plenty of other places than churches. One might, for example, wax eloquent over the conflict in our own time between science and advertising, the trashy popular reading, not literature, which goes with advertising, the popular education which trains the masses not in useful trades but in just enough book-learning so that they may read the daily paper and cheap magazine and may be taken in by advertising, and trains the few who go on to university courses in business psychology just a little more so that they can fool the others by advertising. If half this time and space and effort that is now given over to tempting and deceiving and stimulating and glutting the appetite of the consumer were devoted to training and encouraging the producer, what art we might be enjoying instead of constantly consuming more than we produce and robbing future generations of their natural resources. For twenty years now I have been

studying the magic of the past, and, believe me, some of the present generation of advertisers need yield nothing to the past generations of magicians in their trust in the power of mere words and images and agreeable mental illusions and delusions, in their theory of some occult virtue of salesmanship, and in their exploitation of popular lusts and credulity. The chief respect wherein they differ from the old magicians is that these advertisers have less regard for concrete objects and for laws of nature. It is indeed painful to see institutions of higher learning begin to pander to this popular immoral and unscientific demand from the business world. Still it need not give us a great deal of concern; let that sort of people teach advertising if they like; so long as they keep out of history and science, it is so much gain. Does this diatribe against modern advertising seem to your cool common sense and sane judgment a trifle overdrawn—perhaps even out of place in a scientific discussion? Very good! But let me add that it is not a whit more so than are most animadversions by historians of science upon the medieval church.

#### THE PASSING POPULAR MILIEU IS TO BE DISREGARDED

Moreover, I look back to the centuries before popular education was supported by printing, and in the second century I hear Galen complaining that there are not five persons known to him who really prefer truth to seeming; I hear Boethius in the sixth century grieving that the vulgar have torn off philosophy's robes and left the essential truth naked and crying for covering; I hear William of Conches in the twelfth century grumbling at the way that the bars have been let down in the educational system in his day, and even ceasing to teach because of the onslaught of the unskilled multitude; I hear Roger Bacon in the thirteenth century embittered by the facile successes of the boy theologians. But where to-day are those popular, superficial, successful contemporaries of whom Galen, William, Roger and other real scholars and scientists in the past complained? Gone! absolutely forgotten as individuals, very probably not a single manuscript written by them preserved, unmentioned in the writings which are extant except collectively and unfavorably; in short, but for the discontented grumbling of the Galens, the Williams and the Rogers we should have no evidence of their *quondam* existence. But Galen, William, Roger and their peers live on. In the passing world of talk rank weeds may flourish, but in the enduring world of books there is a survival of the fittest. The trouble with us historians has been that we waste our time in writing histories of politics for statesmen who never look into a history until they come to write their own memoirs, or economic

history for business men who read nothing but the stock market reports, instead of writing histories of books for readers. Historians of science need give even less attention to the fleeting ghost-like "spirits of the times" to existing society and contemporary custom, to political and economic conditions, while they may center attention the more on the enduring and progressive process of human thought. We can trace our intellectual ancestors a long way back. Each new war blots out the interest in the previous war; each change of ministry relegates once familiar figures to a gloomier obscurity; but every future scientist can find common ground of sympathy with those men of old. History, as Osler so well said, is simply "the biography of the human mind."

#### THE PROGRESS OF THOUGHT

The history of science, when sufficiently disclosed, should throw a great light on the problem how new ideas and theories gradually evolve out of the previous common stock possessed by mankind. In analyzing past writings and surveying past centuries I have been impressed by the slowness and gradualness with which ideas change, and by the really very small number of ideas which men have thus far entertained or expressed, much as man has domesticated only a few animals. Many men of learning, and famous ones, too, have seemed to repeat ideas parrot-like, and I can not convince myself that this is merely patristic or scholastic; it has seemed to me everlastingly human. There are also, it is true, minds that seem more restive, skeptical, experimental, original, creative; but when any new conception emerges, it often appears to be not the product of a single mind but rather to have been entertained simultaneously by several contemporaries. Thus, when the time is ripe, a new idea takes hold of the more progressive and open minds of that generation. And I wonder if we have sufficiently allowed for the wide and rapid spread of ideas in the past, despite linguistic barriers and primitive methods of communication. After all, the ancients represented fame and rumor as swift. If eels migrate incessantly from one region of the Atlantic to inland streams and ponds of Europe and America, if germs of disease carried the Black Death from Tartary to England, if Chinese jade went through to Troy four thousand years ago, would not winged words and valuable ideas spread, too? The ideas were fewer than the eels or the germs, it is true, but are they not also more indestructible? Ideas change, but it was a medieval writer who said, "Science always is making acquisitions and never grows less."

## IMPORTANCE OF THE MIDDLE AGES

Already I have ever and anon been defending the so-called middle ages, and my next point will be that they constitute the immediate and most essential background of modern science. It will not do to trace the story of science through the classical period and then, in the words of a book on the Septuagint which I have just been reading, "resume . . . after a blank space of, roughly a thousand years with the invention of printing." No, we must abandon the absurd prejudices against and ignorance of the middle ages which we have inherited and poll-parroted from narrow Italian humanists, from Protestant reformers and Fox's Book of Martyrs, or from the eighteenth century deists, Voltaire and Tom Paine; we must correct and expand our notion of "modern progress," and subject the period before America was discovered to impartial open-minded scientific investigation. The historians of art have done this and found Gothic architecture first in quantity of noble remains and second to none in quality. The philologists have done this, discerning in the middle ages the cradle of our modern languages and literatures. Now, after having sought out, scrutinized scientifically and published most of the extant material in the vernacular languages, they are, I am glad to say, beginning to turn to the richer medieval literature in Latin and are organizing for its systematic exploitation. Students of economic history are pointing out such facts as that the same English towns which were prosperous and prominent in the thirteenth century came to life again only in the nineteenth century. Similarly representative government, found all over Europe in the thirteenth century, was thereafter gradually suppressed by kings until it revived again in the last century. In science and learning there has been no such setback as that, and no one must expect to find a startling likeness between the science of the thirteenth and the science of the nineteenth centuries, because other centuries of scientific progress have intervened between them. It is also true that in western Europe the very earliest medieval centuries seem a time of retardation in scientific development analogous to the depression which has prevailed in architecture and sculpture since, say, the seventeenth century. But the remainder of the medieval period has abundant extant materials for the history of science, more so probably than for any other side of human life except religion and perhaps art. The works can be more accurately dated and the relations between different authors traced more clearly than in the age of Greece and Rome. Various scholars have begun to publish and edit portions of this hitherto too neglected material, and the further study of it should greatly illuminate the process of human

thought in general and the development of modern science in particular. There is much magic and superstition intermingled with this medieval science—as, for that matter, there was with ancient science. This we must study, too, if we wish at all completely to comprehend the evolution of human thought and of modern science.

#### EVOLUTION AND THE HISTORY OF SCIENCE

You scientists, who accept the theory of evolution, who not merely experiment in the present but study fossils and the bones of extinct animals, who trace geological formation far, far beyond the first vestiges of human history and thought or even life, who perhaps experiment with the most primitive and elementary forms of life in order to understand the highest forms, who have abandoned the belief in permanence of species, who have tracked the sources of the most complex organisms back to the simple single cell and find there, perhaps, determinants of all the long-drawn-out later developments—you scientists, I say, can surely comprehend not the mere value but the pressing necessity for tracing the history and evolution of science itself, and for tracing it far, far back of the nineteenth century or Newton or Galileo or the invention of printing, for investigating it not merely in the recent butterfly stage of modern science, not merely in the larval stage of Greek thought, but also in the pupa of the so-called middle ages, and in the egg, it may be, of primitive folk-lore. You will not hesitate to commend the study of that other and seemingly earlier species of human thought, the superstitious and magical, with which science was for a long time at least closely related, if it did not indeed evolve from it. You will no more scorn the earliest crudest effort at experimentation, the first childish curiosity concerning nature, the first fantastic superstitious attempts to control nature than you would scorn embryology, the cell doctrine, and the investigation of planarians. It may not be such a far cry after all from such a treatise as the supposititious “*Secrets of Women*” of Albertus Magnus to recent theories of sex determination.

#### THE PAST WAS NOT ROMANTIC AND UNNATURAL

As you undertake to explain all past geological change by processes which can still be observed to-day, so you will expect to find the human mind developing slowly but steadily and scientific progress occurring step by step. But you will be suspicious of any historian who represents the past as romantic and unnatural; full, for instance, of inquisitors with thumbscrews, of imprisoned scientists writing in complicated ciphers, or of marvelously cultured Arabs, although their immediate ancestors were illiterate nomads and their present progeny are blind to the benefits of



British rule in Mesopotamia. What was the true state of affairs? Something nearer to this: even theologians obsessed by scientific curiosity, writing mathematical treatises, and performing natural experiments; even writers of the cryptic and occult recognizing the ascendancy of science; and far more scientific manuscripts in medieval Latin extant from little western Christian Europe than in Arabic from all the vast expanse of Moslem rule from Spain to India and Madagascar. When Pliny the Elder called his combined conspectus of ancient science and natural magic and record of civilization "Natural History," he chose a good title. May we investigate both nature and civilization as he did; and not only may our science be "organized common sense," but our history of science be scientific and natural and free from that credulous, fantastic, exaggerated and romantic strain, from which Pliny, try as he might, was unable to purge his book and his thought.



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L'Encyclopedie and the History of Science

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# L'Encyclopédie

## and the History of Science

Encyclopedias are perhaps the most important monuments of the history of science and of civilization. Not only do they comprise a wealth of detail brought together with the prime purpose of giving information, so that they are at least less intentionally misleading than many other documents. They also aim to cover the entire field of human interest in their day, so that the argument from silence can be employed in their case with more assurance than in other cases, and some quantitative conclusions may be ventured upon from the way in which their space is apportioned among the different fields of human endeavour, although of course this is to some extent a matter of chance, and the editors of the famous French *Encyclopédie* (1) which is the object of the present study had occasion to

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(1) JOHN MORLEY, *Diderot and the Encyclopaedists*, 1878, 2 vols., seems to be still the most comprehensive work on the subject. Most biographies of DIDEROT or other works on him are rather slight or at least contain little to our purpose. M. ROUSTAN, *Les philosophes et la société au XVIII<sup>e</sup> siècle*, Université de Lyon, *Annales, Nouvelles série*, 1906, Fasc. 16, does not include science in its scope. R. L. CRU, *Diderot as a Disciple of English Thought*, *Columbia University Studies in Romance Philology*, 1913, shows that DIDEROT was much more indebted to EPHRAIM CHAMBERS' *Cyclopaedia* of 1728 than he admitted, and also copied a good deal from BRUCHER's *Latin History of Philosophy*. CRU says at p. 284.

"The great haste and secrecy with which the main part of the *Encyclopédie* had to be written, especially after the desertion of d'ALEMBERT and of many contributors, the urgent necessity of completing... a work for which the subscribers had paid in advance and in which the fortunes of several booksellers were involved, compelled him (DIDEROT) to finish almost alone a task which today requires the work of hundreds of scholars and scientists." The part of *l'Encyclopédie* thus characterized is, however, one with which the present article will be little concerned. Indeed, d'ALEMBERT rather than DIDEROT will be our guiding star.

D. MORNET, *Les sciences de la nature en France au XVIII<sup>e</sup> siècle*, 1911, (290 pp.) centers its discussion about BUFFON and does not have much to say concerning *l'Encyclopédie*. However, it cites the articles "Experimental" (pp. 75, 77, 86, 92, 136, 148), "Fossiles" (pp. 19, 61), "Scolastique" (p. 77), "Montagnes" (p. 120), "Cabinet d'histoire naturelle" (p. 231), "Hypothèse" (p. 105), "Système" (p. 107). MORNET treats especially of the influence of science on the general reading public.

complain that their contributors often composed articles of a length disparate to the relative importance of the subject treated. Even a one-man compilation such as the *Natural History* of PLINY the Elder appears to be our most comprehensive source for ancient civilization. A modern encyclopedia, to which various authorities in different departments are supposed to contribute, although a certain amount of unintelligent hack-work and repetition of previous encyclopedias may creep in, should, in its many-sided reflection of various aspects of civilization from different points of view, constitute a far more valuable picture of our civilization.

This possibility was well recognized by the editors of the eighteenth century French *Encyclopédie*. DIDEROT in the article « *Encyclopédie* » often adverts to the invaluable handy information which posterity may glean from their work concerning the conditions then prevalent. In defending certain historical disquisitions on such themes as cooking and fashions in clothing, which some readers and critics of the previous volumes had regarded with disfavor, he affirmed, — not perhaps without a touch of that playful irony which gives the *Encyclopédie* a spice generally lacking in its more recent imitators, although PLINY its ancient predecessor had likewise indulged in satire and irony, — that « the most succinct of our articles of this sort will perhaps save our descendants years of research and volumes of dissertations », and that « a writing on our modes which is today thought frivolous will be regarded two thousand years from now as a learned and profound work on French costume, a work very instructive for men of letters, painters, and sculptors ». Whatever his publisher thought, DIDEROT did not conceive of l'*Encyclopédie* as a commercial undertaking nor as of the nature of ephemeral or popular literature, but as « *un dictionnaire universel et raisonné* », intended for the general and permanent instruction of mankind. It is as such that we shall accept it and examine it in the following pages. Our survey will be based primarily upon the original folio edition of 1751 and following, and our illustrations will be drawn chiefly from the earlier volumes in which the editors were freer in working out their plan and ideals without interference, and not from the last ten volumes which, after the suspension of the undertaking by the Parlement of Paris and the withdrawal of the scientist D'ALEMBERT from the co-editorship in 1759, were hurriedly and secretly completed by DIDEROT and then, without DIDEROT's knowledge, were much mutilated by the timid publisher, LEBRETON. Only in a few instances shall we include

articles from the supplementary volumes which were issued in 1776.

Our concern will be with the place of l'*Encyclopédie* in the history of science. This topic appears to have hitherto received little attention, either from the historians of the sciences or from students of the eve and background of the French Revolution. DIDEROT is noted individually in the history of medicine for his *Letters on the Blind* (2) and as a biologist has been represented as a forerunner of BICHAT, LAVOISIER, GALL and DARWIN (3). D'ALEMBERT is of course a well known name in the history of mathematical science and celestial mechanics. But when the Encyclopedists are viewed collectively, it is usually as materialistic « philosophers » who attacked the church and Bible and Christian religion, also « *les abus* » generally, and who agitated or paved the way for political and social reform (4). For JOHN MORLEY « philosophy » in the French eighteenth century sense of the word and as used in l'*Encyclopédie* was more or less identical with liberalism and the idea of progress. But I cannot interpret its meaning as quite in that sense. Not only does it, like the philosophy of ancient Greece, include all the sciences, natural, mathematical, and social; scientific research is its very essence. In its very title science came first : *Encyclopédie ou dictionnaire raisonné des sciences, des arts et des métiers par la société des gens de lettres*. When d'ALEMBERT in the *Discours préliminaire* states that « the Renaissance of letters... that memorable epoch..., began with erudition, continued with Belles-Lettres, and ended in philosophy » (5), he has in mind especially the scientific advance of the eighteenth century. DIDEROT, too, in the article « *Encyclopédie* », in comparing his own age with the seventeenth century, says, « Those sciences least common in the century past become more common from day to day », and speaks of the « general movement toward natural history, anatomy, chemistry, and experimental physics » (6). He even had confidence

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(2) See FIELDING H. GARRISSON, *An introduction to the History of Medicine*, third edition, 1921, p. 360.

(3) F. PAITRE, DIDEROT *biologiste*, Lyon, 1904, 106 pages.

(4) See the work of JOHN MORLEY above-cited, pp. 4-5, and which will henceforth be referred to by the brief indication, MORLEY (1878).

(5) « ...la renaissance des Lettres ...cette époque mémorable.. On a commencé par l'Erudition, continué par les Belles-Lettres, et fini par la Philosophie ».

(6) « Les connoissances les moins communes sous le siècle passé le deviennent de jour en jour... mouvement général vers l'Histoire naturelle, l'Anatomie, la Chimie, et la Physique expérimentale.

that the expressions proper to those sciences would change the face of even popular speech, and that before another century passed a dictionary of the Age of LOUIS XIV or even of his own would not contain two-thirds of the words then in use. Alas! the technical vocabulary of the various sciences has increased too rapidly for any general assimilation of it into human speech, or, which is even more regrettable, for any adequate absorption of scientific discovery and method into the general current of human thought.

Yet this last, too, was what DIDEROT and D'ALEMBERT and their collaborators hoped and worked for, although they realized the need of two sets of workers, namely, researchers and winnowers (7). And it was in this connection that much of the philosophizing, more strictly called, of the two editors themselves came in. « Every science, every art has its metaphysics », says DIDEROT. « This side is always abstract, lofty, and difficult. Yet it should be the chief concern of a philosophic dictionary » (8), such as l'*Encyclopédie*. Similarly D'ALEMBERT in treating the topic, « *Elements des sciences* », states that what is most needed is a metaphysics of propositions, which should be nothing more than a clear and precise exposition of the general and philosophic truths on which the principles of the science are founded. D'ALEMBERT would perhaps agree with DIDEROT that the problem of making such an exposition was difficult, but he believed that the result should be easy to assimilate. « The simpler, easier, and, so to speak, more popular this metaphysics is, the more precious it is », for « truth is simple and should be treated as it is » (9). Yet D'ALEMBERT had no patience with mere speculation or theorizing in physical science, and in both his articles on *Physique* and on experimental method strongly advised against « giving reasons for what escapes us » and against « that craze for explaining everything which DESCARTES introduced into physical science » (10). In both articles he gives the same illustration that, supposing the

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(7) Described in DIDEROT's article *Encyclopédie*; the researchers would read but little, the others would thumb volumes day and night to separate what was worth receiving and conserving.

(8) « Toute science, tout art a sa métaphysique. Cette partie est toujours abstraite, élevée et difficile. Cependant ce doit être la principale d'un dictionnaire philosophique ».

(9) « Mais la vérité est simple et veut être traitée comme elle est. »

(10) Article *Experimental*; « Cette fureur d'expliquer tout ce que DESCARTES a introduite dans la Physique ».

barometer rose before rain, physicists would explain the action by saying that the air had become heavier through being charged with vapors, and this would seem a reasonable explanation. But it is not satisfactory because the barometer falls instead of rising before rain. Or if it were the case that snow fell in summer and hail in winter, the explanation might be given that this was because in summer the heat of the air kept the particles from congealing completely, while in winter the cold air near the earth hardened them into hail-stones. This explanation would satisfy everyone, says D'ALEMBERT, and pass for demonstrative. Yet the fact which it explains is false. D'ALEMBERT also quotes with approval from MUSSCHENBROECK's *Essai de Physique* the assertion that « when one examines everything exactly, one finds that there are many more particular laws than general laws » (11). So much for some indication that, while somewhat more spirited and readable, not to say better written, than most modern encyclopedia articles and scientific monographs, *l'Encyclopédie* is not dominated by some facile philosophy but is permeated by a truly scientific spirit. And lest I seem unfair to Lord MORLEY, let me hasten to add that he was aware that DIDEROT, unlike VOLTAIRE and ROUSSEAU, had the idea of scientific method as well as the « rare faculty of true philosophical meditation », and that the social philosophy of *Encyclopédie* was founded in positive science (12). But Lord MORLEY was mainly interested in the social philosophy; we shall interest ourselves in the science.

Since, however, our investigation is an historical one, and since history may be regarded as one of the sciences — just as some of them are still classed as *Histoires* in *l'Encyclopédie*, while D'ALEMBERT closes his article on experimental method with the suggestion that in addition to the chair of experimental physical science recently established by the king at the University of Paris there should be three others in Ethics, Public Law, and History (13) — since this is the case, we may well commence with the attitude of *l'Encyclopédie* toward history and the history of science. « It is not enough for

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(11) Article *Physique mécanique et corpusculaire*; « Quand on examine tout avec exactitude on trouve qu'il y a beaucoup plus de lois particulières que des lois générales ».

(12) See MORLEY (1878), pp. 8-9.

(13) Article *Experimental*; « trois objets qui appartiennent en un certain sens à la philosophie expérimentale prise dans toute son étendue ».

us », observes D'ALEMBERT in the *Discours préliminaire*, « to live with our contemporaries and to lord it over them. Moved by curiosity and self-love, and seeking with natural avidity to embrace at once past, present, and future, we wish at the same time to live with those who will follow us and to have lived with our predecessors. Hence the origin and the study of history » (14). Nor is it a science without high utility. « Philosophy, often powerless to correct abuses, can at least disentangle their origin (15). » DIDEROT for his part, in listing the qualifications of the ideal author and the ideal editor for an encyclopedia, stated some of the most essential traits in an historian. He should narrate events of his own time, « as if he were a thousand years off, and those of his native place, as if he were two thousand leagues away » (16). He should never be enthusiastic except for truth, virtue, and humanity. A great knowledge of bibliography is necessary or he will « repeatedly compose in mediocre style at much labor, time, and expense what others have done better » (17), and will go to great trouble to discover what is already known. Finally, « the exact citation of sources would be of great utility; one ought to make it a rule » (18).

The value of the history of science is recognized in the *Discours préliminaire*, where it is said that « the historical exposition of the order in which our sciences have followed one another will... enlighten us ourselves as to the way in which we should transmit these sciences

(14) « Ce n'est pas assez pour nous de vivre avec nos contemporains et de les dominer. Animés par la curiosité et par l'amour propre, et cherchant par une avidité naturelle à embrasser à la fois le passé, le présent et l'avenir, nous désirons en même temps de vivre avec ceux qui nous suivront, et d'avoir vécu avec ceux qui nous ont précédés. De là l'origine et l'étude de l'Histoire. »

(15) « ...la philosophie souvent impuissante pour corriger les abus peut au moins en démêler la source. »

(16) Article *Encyclopédie*; « racontant les choses du moment où il vit comme s'il en étoit à mille ans, et celles de l'endroit qu'il habite comme s'il en étoit à deux milles lieues ».

(17) « D'ailleurs faute d'une grande connoissance de la bibliographie, on est exposé sans-cesse à composer médiocrement, avec beaucoup de peine, de temps, et de dépense, ce que d'autres ont supérieurement exécuté. On se tourmente pour découvrir des choses connues. »

(18) « La citation exacte des sources seroit d'une grande utilité : il faudroit s'en imposer la loi ».



to our readers » (19). And some of the particular articles, such as « Anatomie » (by HALLER, which appeared first in the supplementary volumes of 1776), « Chirurgie » and « Bibliothèque » contain very good or full historical summaries for the time when they were written. From them the historian of science might possibly get some valuable hints even today.

But an unfortunate philosophy of history and interpretation of the course of civilization tends to vitiate the historical outlook of l'*Encyclopédie* as a whole, and has similarly affected the study of the history of science since, although I do not know if this is a direct legacy from the French encyclopedia passed on through its various successors. First there is the notion that the history of science « is naturally bound up with that of a small number of great geniuses » (20), such as HIPPOCRATES in antiquity, ROGER BACON and ALBERTUS MAGNUS in the middle ages — who, though they lived in times when the profoundest ignorance prevailed, yet possessed a universality of knowledge in all the sciences « so uncommon in our enlightened age that they would pass even today for prodigies » (21)—, FRANCIS BACON, that great forerunner of the light, though « born in the bosom of blackest night », DESCARTES, who « changed the face of philosophy » (22), GALILEO, and especially LOCKE and NEWTON. As a matter of fact, of course, the works attributed to HIPPOCRATES were composed by a number of subsequent writers over a considerable lapse of time (23), which is perhaps a sufficient indication that great names are apt to have more credited to them than is their due. Second, there is far too emphatic and exaggerated generalization, as we have just incidentally noted, to the effect that the middle ages were « a long interval of ignorance », when for twelve centuries the chief works

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(19) « L'exposition métaphysique de l'origine et de la liaison des Sciences nous a été d'une grande utilité pour en former l'Arbre encyclopédique; l'exposition historique de l'ordre dans lequel nos connoissances se sont succédées ne sera pas moins avantageuse pour nous éclairer nous-mêmes sur la manière dont nous devons transmettre ces connoissances à nos lecteurs. »

(20) *Discours préliminaire*; « D'ailleurs l'histoire des Sciences est naturellement liée à celle du petit nombre de grands génies... »

(21) Article *Cordelier*; « Si peu connues dans notre siècle éclairé qu'ils passeroient encore aujourd'hui pour des prodiges. »

(22) *Discours préliminaire* for these two phrases.

(23) See TH. BECK, *Hippokrates Erkenntnisse*, and W. SCHONACK, *Curae Hippocraticae*, Königsberg, 1908. S. HORNSTEIN, « Untersuchungen z. hippokrat. Korpus », in *Primitiae Czernovicienses*, 1911, pp. 54-82, and T. GOMPERZ, « Die hippokrat. Frage... » in *Philologus* 70, 213-41.

of the ancients were forgotten, when the church persecuted scientists, and when scholasticism « constituted all the pretended science of centuries of ignorance » (24).

The short article « Architecture » by BLONDEL is written from the academic Palladian standpoint which idolized the « simplicity, beauty, and proportion of ancient architecture » and insisted upon « propriety and correctness of design ». The article « Cathédrale » is even briefer, while full descriptions are given of military matters and industrial processes. It may be noted, however, that BLONDEL applied the term « Gothic » to the architecture of the early medieval period before CHARLEMAGNE, which he regarded as heavy and northern and the opposite extreme from the later medieval building, which went in his opinion to an excess of delicacy and profuse ornament under southern Saracen influence. BLONDEL evidently had a very imperfect knowledge of the history and dates of medieval architecture, and ascribed great influence on its course to HUGH CAPET and his son ROBERT.

As far as the disparagement of medieval science is concerned, some of the particular articles contain mentions of medieval scientists such as AL-HAZEN and WITelo (25) which are scarcely consistent with it. D'ALEMBERT concedes the discovery of the musical scale to GUIDO D'AREZZO (26) (c. 995-1050 A. D.), and has the grace to recognize that the origin of all our ideas in sensations had been held axiomatic by the scholastic philosophers long before LOCKE, but had been rejected during the Renaissance along with the rest of scholasticism (27). But such concessions and mentions of individuals affect not at all the general attitude of l'*Encyclopédie* towards antiquity, middle ages, and « Renaissance ». The difficulty is that the names of medieval scientists, when mentioned, have simply been taken from previous histories of the sciences; there is no evidence that their works had been looked into, much less read through, by the writers of the articles in l'*Encyclopédie*. It would have been better had d'ALEMBERT applied to the middle ages as well his *bon mot* concerning the ancients, « to whom we believe ourselves very superior in the sciences because we find it shorter and more

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(24) *Discours préliminaire*; « La Scholastique qui composoit toute la Science prétendue des siècles d'ignorance... »

(25) See article *Catoptrique*.

(26) See article *Gamut*.

(27) See *Discours préliminaire*.

agreeable to prefer ourselves to them than to read them » (28). Then he might have realized that it was not the ancients alone who « have not neglected *la physique expérimentale* as we ordinarily suppose », and might have avoided such errors as placing JOHN CAMPANUS of Novara in the eleventh century instead of the last half of the thirteenth, calling ADELARD OF BATH a monk, making GUIDO BONATI come from Friuli, dating PETER OF ABANO in 1320, and asserting that the only medieval version of the *Almagest* was a Jewish translation of an Arabic translation of a Syriac translation (29). But usually *l'Encyclopédie* makes no such recondite allusions as these to medieval science but contents itself with such legends as that of the condemnation of Bishop VIRGILIUS for believing in the Antipodes (30) or the

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(28) See article *Expérimental*.

(29) For these statements see article *Astronomie*.

(30) See article *Antipode* and also the *Discours préliminaire* where d'ALEMBERT says, « comme le pape ZACHARIE avait condamné quelques siècles auparavant (i. e. before the time of GALILEO) un Evêque pour n'avoir pas pensé comme SAINT AUGUSTIN sur les Antipodes et pour avoir deviné leur existence six cents ans avant que CHRISTOPHE COLOMB les découvrit ». A writer in the *Mémoires de Trévoux*, 1708, had questioned if the papal letter was ever enforced against VIRGILIUS, but d'ALEMBERT will have none of this. He also rejects the suggestion that VIRGILIUS believed in the existence of two suns and two moons, and holds that the « another sun and moon » of the papal letter have reference to our sun and moon as seen from the other side of the globe.

The Latin text of the letter will be found in MIGNÉ, *Patrologia Latina*, vol. 89, where the portion concerning VIRGILIUS occurs in col. 946. After alluding to how VIRGILIUS has been stirring up trouble between BONIFACE and the duke of the Bavarians, the pope further instructs BONIFACE : « De perversa autem et iniqua doctrina eius, qui contra Deum et animam suam locutus est, si clarificatum fuerit ita eum confiteri, quod alius mundus, et alii homines sub terra sint, seu sol et luna, hunc habito consilio ab ecclesia pelle sacerdotii honore privatum. » This may be translated : « As for his perverse and wicked doctrine which he has uttered against God's glory and his soul's safety, if he shall have unmistakably acknowledged a belief in another world and other men under the earth, or (another?) sun and moon (so placed?), hold a council, unfrock him, and expel him from the church ».

The Provost of Eton, in the *Cambridge Medieval History*, vol. III, pp. 512-13, doubts if VIRGILIUS was « an early martyr of science, persecuted and silenced by clerical obscurantists because of his belief in the Antipodes », and suggests that it is much more likely that a survival of pagan belief in « the underground people » of Celtic or Scandinavian fairy lore was what Pope ZACHARIAS had it in mind to condemn.

HERMAN VAN DER LINDEN, « *Virgile de Salabourg, et les théories cosmographiques au VIII<sup>e</sup> siècle* », Brussels, 1914, 27 pp., and the review thereof by

persecutions suffered by Friar BACON (31), whom JEBB's publication of the *Opus Maius* in 1733 had recently recalled to men's minds and whom d'ALEMBERT does characterize as « the monk (*sic*) BACON, too little known and too little read today » (32). HALLER's long account of the history of anatomy totally omits the middle ages and is valuable and very detailed for the period from VESALIUS on. And in general it is only for the sixteenth and seventeenth and early eighteenth centuries that l'*Encyclopédie* gives any accurate, interesting information anent scientific men and discoveries, some of whom are possibly now in their turn too forgotten.

We have already implied that l'*Encyclopédie* held the now much shattered and well nigh totally abandoned theory of the Renaissance in the closing fifteenth and sixteenth century, which it regarded as « one of those revolutions » which are necessary to free mankind from barbarism and which change the face of the earth. « The Greek Empire is destroyed, its ruin causes the little learning that still survived to flow back into Europe : the invention of printing, the protection of the MEDICIS and of FRANCIS I revived the mind of man; and light everywhere had new birth » (33). What an improbable,

S. GÜNTHER in *Mitteilungen zur Geschichte der Medizin und der Naturwissenschaften*, XIV (1915), 23-24, review the previous literature anent VIRGILIUS from AVENTINUS (JOHANNES THURMAYR, 1477-1534), the father of Bavarian history, down through KEPLER, DESCARTES, and others to the present. They also recognize that belief in the Antipodes was not so exceptional at that time, and that, whatever other outcome the letter of ZACHARIAS may have had, it did not prevent VIRGILIUS from becoming a bishop in 767 under the later pope, PAUL I, or from being canonized in 1233 by GREGORY IX.

(31) See article *Cordelier* : « Le frère BACON, célèbre par les persécutions qu'il essuya dans son ordre et par les découvertes qu'il fit dans un siècle de ténèbres. »

(32) See article *Expérimental* : « Le moine BACON, trop peu connu et trop peu lu aujourd'hui... dans le sein de la plus profonde ignorance il sut par la force de son génie s'élever au-dessus de son siècle. »

(33) « *Discours préliminaire* » ; after a few such phrases as « en sortant d'un long intervalle d'ignorance » and « l'état d'esclavage où presque toute l'Europe étoit plongée » with reference to the medieval period, d'ALEMBERT proceeds : « Aussi fallut-il au genre humain pour sortir de la barbarie une de ces révolutions qui font prendre à la terre une face nouvelle : l'Empire Grec est détruit, sa ruine fait refluer en Europe le peu de connoissances qui restoient encore au monde : l'invention de l'imprimerie, la protection de MEDICIS et de FRANÇOIS I animent les esprits ; et la lumière renaît de toutes parts. »

insufficient, irrelevant, rhetorical set of explanations! D'ALEMBERT would have been ashamed to approach a problem in physics in this manner. Yet such explanations of the « Renaissance » satisfied most writers and readers for over a century longer. But D'ALEMBERT was at least keen enough to see that the humanists had the defects of servile imitation of the ancients and too great self-complacency, and that they too narrowly devoted themselves to literary erudition, to the exclusion of scientific research and political and social reform.

The philosophy of history, then, is a weak point of l'*Encyclopédie*, not in harmony with the scientific spirit evidenced elsewhere in it, lending justification to the charge of shallow thinking and too great trust in « reason » which has been made against the French « philosophers ». Sometimes, however, D'ALEMBERT makes a happy observation, as when he says that « the infancy of the sciences is long, or better, eternal » (34). And the theory of revolutions expressed so frequently in l'*Encyclopédie* is interesting both as a sort of survival of the astrological doctrine of revolutions, and in view of the approaching French Revolution at which the encyclopedists more than once hint darkly (35).

Along with this faulty philosophy of history goes an uncritical attitude in historical matters generally. Indeed, the fact that at first

(34) Article *Experimental* : « et l'enfance des Sciences est longue, ou, pour mieux dire, éternelle. »

(35) D'ALEMBERT touched on the point in the « *Discours préliminaire* » as noted in note 33 above; DIDEROT speaks of such revolutions in the article « *Divination* » and again in the article « *Encyclopédie* », where he says : « Le moment le plus glorieux pour un ouvrage de cette nature, ce seroit celui qui succéderoit immédiatement à quelque grande révolution ; qui auroit suspendu les progrès des Sciences, interrompu les travaux des Arts, et replongé dans les ténèbres une portion de notre hémisphère. Quelle reconnoissance la génération qui viendrait après des tems de trouble ne porteroit-elle pas aux hommes qui les auroient redoutés de loin ; et qui en auroient prévenu le ravage, en mettant à l'abri les connoissances des siècles passés ? » What honors, he adds, will they not heap on the authors who suffered for it, what indignation on their enemies ; what glory 'twill lend to the Monarch or Minister under whom it appeared and to the Great who favored it ! D'ALEMBERT, too, returned to the subject again in the article « *Experimental* » where he said that, once the foundations of a revolution were laid, it would almost always come to a head in the generation following ; « seldom sooner because the obstacles to it perish rather than yield ; seldom later than that because when once the barriers are broken the human spirit often goes faster than itself intends, until it meets a new obstacle that

« all the articles in ancient and modern history », as well as « all the articles concerning poetry, eloquence, and literature in general » (36), were the work of MALLET (1713-1755), a doctor of theology and professor at Paris, who further was responsible for the theological articles, does not augur well for the independent treatment of history in l'*Encyclopédie*. However, he does not seem to have had much to do either with its philosophy of history or its treatment of the history of science.

At first it amazes the reader that a work supposed to represent a revolt against the Christian church should unquestioningly accept the chronology of the Old Testament as the opening chapter of human history, and begin its historical introduction concerning almost any topic with an account of the belief or practice of the ancient Hebrews in this regard. I fail to detect any satire or mental reservation in such passages; they seem the regular course of procedure and quite matter-of-fact. It must be kept in mind that scientific excavation and archaeology had not yet disclosed the early history of man; that Africa, Australasia, and most of America were still unknown continents, while countries like Russia and Japan were outside the pale of civilized intercourse; that none of the ancient oriental languages had been deciphered, so that a scholar could seriously argue that the arts of divination had arisen from the ancient Egyptians forgetting the meaning of their hieroglyphic symbols and attaching themselves to the mere letters (37). Sanskrit, too, was as yet unknown to European scholars, so that the chief accounts of the early history of man were the Old Testament, Homeric poems, and legends of the seven early kings of Rome. The encyclopedists accepted the last of these three as historic fact, and might equally well accept the first. When NEWTON had gravely discussed the duration of the world on the basis of the chronological implications

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forces it to rest for a long period. » (« Car quand les fondemens d'une révolution sont une fois jettés, c'est presque toujours dans la génération suivante que la révolution s'achève; rarement en-deçà parce que les obstacles périssent plutôt que de céder; rarement au-delà parce que les barrières une fois franchies l'esprit humain va souvent plus vite qu'il ne veut lui-même, jusqu'à ce qu'il rencontre un nouvel obstacle qui l'oblige de se reposer pour long-tems. »)

(36) From the « *Discours préliminaire* » which adds, « On voit par le détail où nous venons d'entrer combien M. l'Abbé MALLET, par la variété de ses connoissances et de ses talens, a été utile à ce grand Ouvrage, et combien l'*Encyclopédie* lui a d'obligation. Elle ne pouvoit lui en trop avoir. »

(37) See the article *Divination*.

of *The Book of Genesis* and had come to the conclusion that the Argonautic expedition would have to be dated in 900 rather than 1400 B. C. (38), is it surprising that D'ALEMBERT, though rejecting as ridiculous the story of the Babylonians having made astronomical observations for 470,000 years, should incline to accept PORPHYRY's assertion that when ALEXANDER THE GREAT took Babylon these observations had been in process for some 1903 years, which would fix the origin of them 115 years after the deluge and fifteen years after the erection of the tower of Babel in a plain where no mountains cut off the view of the stars? (39) Yet on such a topic as the Concordat of 1516 and its relation to the Pragmatic Sanction of Bourges *l'Encyclopédie* offers an admirably clear and precise account.

Indeed in general there is less either of open attack or covert satire against theology and religion than I had expected in *l'Encyclopédie*, and also, perhaps, less than many of its readers were hoping for, as would appear to have been the case from the letters of VOLTAIRE to D'ALEMBERT and the letter of D'ALEMBERT to VOLTAIRE quoted by Lord MORLEY (40). D'ALEMBERT himself, rather than DIDEROT, seems to have been the one most ready to break a lance with orthodoxy or the clergy (41), and sometimes apparently went outside his proper scientific field to write articles which would give him that opportunity, for instance, those on Geneva, the Jewish Cabbala, *Forme substantielle*, *Formulaire*, and Fornication. In dealing with the last topic, as might have been expected, he was ably aided and abetted by VOLTAIRE. The article « *Formulaire* » administers a stinging rebuke to religious quarrels in general and that connected with the Jansenists in particular.

I have never been able to see that the deluge theory in geology was especially the work of the church. Certainly it was not a product of the middle ages, — when there seems to have been rather less respect for the literal sense of the Bible than there was after the invention of printing and the Protestant Revolt (42) — but, as the

(38) SIR ISAAC NEWTON, *The Chronology of Ancient Kingdoms amended; to which is prefix'd a short chronicle from the first memory of things in Europe, to the Conquest of Persia by ALEXANDER THE GREAT*, London, 1728.

(39) See article *Astronomie*.

(40) MORLEY (1878), I, 137-139.

(41) Yet he abandoned the enterprise halfway, while DIDEROT put it through.

(42) For medieval attempts to explain away the literal sense of the Bible in behalf of the scientific attitude see my *History of Magic and Experimental Science*, 1923, II, 58, 175, 197, 414, 464.

article on Fossils in l'*Encyclopédie* states, began to develop in the sixteenth century. Even the letter of the Bible was not here in question, for, as our article further states, *The Book of Genesis* does not say that the fossil fauna and flora buried in the earth or the shells and marine bodies found at great heights above sea level were deposited by NOAH's flood. The theory presumably developed because that flood, like King NUMA or ROMULUS, often suggested itself to the minds of the scientists of that supposedly more enlightened age. If any of them actually desisted from another explanation from fear of religious persecution, one suspects that they must have been under a misapprehension or troubled by their own morbid consciences. Certainly the writer in l'*Encyclopédie* makes no bones of rejecting the deluge as an explanation of the present location of fossils (42a).

On the whole, Christian theology and institutions seem to have been minimized by brevity of treatment and reduction of the amount of space devoted to them rather than by devoting unfavorable attention to them. Thus the writer of the article on Faith, l'Abbé MORELLET of the Sorbonne, whose contributions Lord MORLEY noted as « the chief examples... of a distinctively and deliberately historic treatment of religion » (43), apologizes for the extreme length of his article (44). But it is shorter than that on Fountains or *Forges* or Furnaces, while the article on Fundamentals of Faith occupies less than a page. The success of l'*Encyclopédie*, despite its faults, was ascribed by DIDEROT to the great number of new things in it which could not be found elsewhere (45). And where l'*Encyclopédie* has perhaps had the most lasting and distant effect upon the Christian religion is that people today refer to an encyclopedia rather than read the Bible.

The new matter which crowded out or reduced the relative importance of theological, scholastic, and classical interests was in large measure the full discussion of the mechanical arts, industrial and agricultural processes, and especially machines. And this was the especial department of DIDEROT, himself the son of a cutler. Thus the article on the stocking knitting frame (46) and its 2,500 parts

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(42a) See MORNET, *Les sciences de la nature en France au XVIII<sup>e</sup> siècle*, 1911, pp. 18-23, for some even more fantastic theories of the origin of fossils than that of the deluge.

(43) MORLEY (1878), I, 132.

(44) It covers 16 folio pages in the first edition while the articles on fountains, forges, and furnaces cover respectively 21, 33, and 46 pages.

(45) See article *Encyclopédie*.

(46) See article *Bas*.



was over ten times as long as the article on cathedrals. At that time this frame was « one of the most complicated and important machines that we have ». It is indeed remarkable that DIDEROT should have laid so much stress upon machinery at a time when it was so little developed, and we must regard him as a prophet of the industrial revolution as well as of the French Revolution. The mention of JETHRO TULL in the article on agriculture shows *l'Encyclopédie* in touch also with recent progress in that direction. The article *Bateau*, on the other hand, is very brief, and in general the problem of transportation does not seem to have received great attention. The utilitarian argument advanced in the *Discours préliminaire* on behalf of the mechanical as against the liberal arts would hardly seem to cover the generous space accorded to the art of war. And it is with regret that one finds the article *Machine* occupied more with the infernal machine than any other, and that one further finds its introduction into warfare ascribed not to cruel tyrants but to the Dutch against ALEXANDER OF PARMA and the English against the coast towns of France.

DIDEROT found difficulty in learning about the arts from artisans, who wished to keep their profitable processes secret or feared governmental interference and taxation and often told him « the most ridiculous falsehoods » (47). He also was interested in the history of the mechanical arts and felt the need of an account of their origin, but feared that little historical material would be available and that it would have to be largely hypothetical. D'ALEMBERT, too, in the *Discours préliminaire* asked why those who had developed the mechanical clock and watches should not be as esteemed as those who had successively perfected algebra. In his account of whale-fishing (48) DIDEROT goes into its past history, mentioning the contention of some that sailors from Cap Breton near Bayonne, in following the whales far to sea to discover their retreats, discovered Newfoundland and Canada a century before COLUMBUS, while others held that the first voyage to America for whales was made in 1504 by the Basques.

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(47) See article *Encyclopédie*.

(48) Appended to the article *Baleine*. See J. T. JENKINS, *A History of Whale Fisheries*, 1921, pp. 59-66, for further evidence and bibliography concerning Basque whaling at Newfoundland before COLUMBUS. But he does not mention Cap Breton or *l'Encyclopédie*.

The need of science in the arts was strongly felt by DIDEROT. A well trained naturalist would « recognize at a glance the substances employed by artisans of which they commonly make so much mystery ». Their absurd lies would not impose on a chemist for a moment. A physicist would see the « explanation of no end of phenomena at which the workingmen remain astonished all their lives » (49). So we may credit *l'Encyclopédie* with having done not a little to encourage the development of applied science.

But we now turn to the science more strictly speaking of *l'Encyclopédie* with the particular purpose of examining how far its scientific articles have advanced from the conceptions current in ancient and medieval science to those of recent years, and what their attitude is to the occult science, the magic, and the superstition of which there were so many traces in ancient and medieval science. On the whole it may be said that *l'Encyclopédie* shows us science fairly thoroughly purged of magic, and that its opposition of science against superstition is more frequent and manifest than that of deism against Christianity. But it is further to be observed that neither is much light thrown on the problem how these magical beliefs and practices came to be abandoned, nor are we usually given any more satisfactory or scientific arguments against them than had been adduced in the past. Such superstitious notions are commonly simply dismissed with a stock formula of condemnation to the effect that in this present enlightened century it is unnecessary to demonstrate their chimaerical character (50). This airy waving aside of past tradition and this confidence in contemporary enlightenment does not, however, entirely satisfy us, especially when we read in *l'Encyclopédie* itself that as recent and distinguished a scientist as BOYLE had believed that some amulets were effective, because he had

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(49) « *Encyclopédie* » ; Naturaliste, il connoitra d'un coup d'œil les substances que les Artistes employent et dont ils font communément tant de mystère... La Physique lui rendra raison d'une infinité de phénomènes dont les ouvriers demeurent étonnés toute leur vie. »

(50) Thus in the article, « Abracadabra », we read, « Quant aux vertus attribuées à cette amulette, le siècle où nous vivons est trop éclairé pour qu'il soit nécessaire d'avertir que tout cela est une chimère » ; in « Almanach, » we read, « Notre siècle est trop éclairé pour qu'une pareille défense soit nécessaire ; et quoique nous voyons encore plusieurs almanachs remplis de ces sortes de prédictions, à peine le plus bas peuple y ajoute-t-il quelque foi. » See also the articles on Asp, Ascendant, Astrologer, Catalepsy, Comet, Configuration, Coq, for the same attitude or a silent but complete omission of former superstitions.

finally succeeded in checking a nosebleed when other remedies failed by the method of applying some of a powdered human skull on the skin, while VAN HELMONT had cured patients of the plague by troches of pulverized toads worn as amulets (51). As for philtres, after citing VAN HELMONT, HARTMANN and LANGIUS in their favor, l'*Encyclopédie* concludes that while there may be ones which drive persons mad or cause loss of memory, it is difficult to believe that there are any which inspire love for one particular person rather than for another (52).

Most of the articles on specific magic arts were written by the aforesaid general utility man, MALLET, perhaps being considered to fall under the caption of Theology, which was one of his departments. They are usually disappointing, displaying little originality or breadth of knowledge and being largely based upon DELRIO's *Disquisition on the Magic Arts*. The article on *Magie* itself, however, forms somewhat of an exception, belittling the importance of natural and supernatural (or diabolical) magic, although pronouncing both natural and divine magic unobjectionable. Greek fire is mentioned as an example of the natural magic of the ancients, who are regarded as more advanced in this field than the moderns. But already we find magic regarded as to-day as especially the affair of savage and barbarous peoples (53). It is briefly defined as « an occult science or art which trains one to do things which seem beyond human power » (54). Another exceptional article is that on divination, written by DIDEROT himself, but it is less notable for its discussion of its proper subject than for its conclusion urging the writer's contemporaries to stand out fearlessly against error as CICERO did against divination and the early Christian martyrs did against paganism. However, it also enters on speculations as to the origin of divination under the stimulus of CONDILLAC's *Philosophic Conjectures on the Origin and Progress of Divination*,

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(51) See article *Amulette*. MORNET, *Les sciences de la nature en France au XVIII<sup>e</sup> siècle*, chapter 2, « La lutte contre le merveilleux, » gives examples of the continued belief in the eighteenth century in « marvels of nature », such as a talking dog, the fatal glance of the basilisk, and sirens.

(52) See article *Philtre*.

(53) « *Magie* » ; « Comme c'est une science ténébreuse, elle est sur son trône dans les pays où règnent la barbarie et la grossièreté. Les Lapons et en général les peuples sauvages cultivent la magie et en font grand cas. »

(54) *Ibid.*, « ...science ou art occulte qui apprend à faire des choses qui paroissent au-dessus du pouvoir humain... »

and, besides the usual division of artificial from natural divination, distinguishes from chimaerical divination the experimental variety drawn from natural causes — such as, presumably, weather prediction. The divining rod is handled rather tenderly in the article *Baquette*. Physiognomy, however, is called a pretended art, and the arguments of BUFFON against it are cited, which reduce to the contention that the soul has no connection with the liniments of the face or the figure of the body — a line of argument which would hardly be adopted by a materialistic philosophy such is sometimes thought to have characterized l'*Encyclopédie*. Similarly the chief argument against judicial astrology is the favorite patristic and theological one of human free will and morality (55). All the other arguments are stale and stock, nearly as old as the art of astrology itself, and directed chiefly if not exclusively against horoscope-casting. The attack upon astrology in VOLTAIRE's *Philosophical Dictionary* is even less considerable and made up partly of pleasantries.

MALLET holds fast with BOYLE to natural astrology or astrometeorology, affirming that humidity, heat and cold, and the like are dependent on the revolutions, movements, and positions of the other planets as well as sun and moon; that each planet has its own light, modifying the reflected rays of the sun so that the rays are endowed with a specific power of the planet's own which varies with that planet's aspects in reference to the sun and distance from the sun, and so exerts an energetic virtue on sublunar beings. Astrology thus seems to have lost nothing as a result of the change from geocentric to heliocentric hypothesis. Likewise the preliminary *Explication du système des connoissances humaines*, besides physical astronomy, recognizes as distinct from « the chimaera of judicial astrology » that science of the influences of the stars known as physical astrology. When therefore d'ALEMBERT, writing the article *Astrologue*, says that, while formerly the greatest men seem to have believed in astrology, now the name of astrologer has become so ridiculous « that even the lower classes put but little faith in the predictions of our almanachs », he perhaps means to censure only the prediction of human fate. However, his articles *Ascendant* and *Configuration* are also unfavorable and in the articles *Fœtus* and *Generation* no reference is made to the influence of the planets on the process of the formation of the child in the womb. Here again, as in the case of religion and the

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(55) « *Astronomie* » was treated by d'ALEMBERT, but « *Astrologie* » by MALLET, except that d'ALEMBERT added a bit about the attitude of TACITUS to the subject.

mechanical arts, it is perhaps a case of the attention being diverted to new things, for the space formerly occupied by astrological doctrine is now filled with an account of observations through the microscope. MALLET's article *Arithmancie* warns the reader that the passage in *The Book of Revelation* concerning the number of the beast should not be confused with this divination by means of numbers nor cited to justify it, — possibly a mischievous dig at the Bible.

DIDEROT's distinction between chimaerical divination and the experimental variety drawn from natural causes reminds one of the close connection between magic and experimental books in the middle ages. In D'ALEMBERT's article on experimental method he makes a distinction between observation or even ordinary human experience and the experimental method. To the last the ancients did not apply themselves to any great extent, contenting themselves with reading the book of nature, but very assiduously and with better eyes than moderns think, but cultivating experiment proper only in the useful arts and not to satisfy, like us, a purely philosophical (or scientific) curiosity. Experimental method seeks to penetrate more deeply into nature's secrets, to create somehow by different combinations of bodies new phenomena to study: in fine, it does not merely listen to nature but questions and heckles her (*la presse*). One might call it occult physics, provided the word « occult » be understood in a more philosophic (scientific) and true sense than by certain modern physicians (or, physicists) and restricted to knowledge of concealed facts, not applied to the romance of supposed facts. Here again the association of the experimental with the occult, but passing from the magical to the scientific realm! And while we have heard D'ALEMBERT advise against « giving reasons for what escapes us », he would only encourage « that spirit of conjecture which, at once timid and enlightened, leads sometimes to discoveries », provided it remains conjectural until real discovery is assured.

D'ALEMBERT's use of the word « occult » suggests the question, how far does the belief in occult virtues survive in *l'Encyclopédie*. We have already touched somewhat on the point in speaking of amulets and philtres. The marvelous properties that had been once attributed to gems are totally discredited and even the medicinal properties are usually omitted in the articles on the stones themselves (56). As M. DE VANDERNESSE remarks in his article on the

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(56) See, for instance, the articles on the agate, amethyst, alectory, and bezoard.

agate, « Great virtues are attributed to the agate the same as to other precious stones; but they are all imaginary ». Even the bezoard is discussed at some length without mention of the virtues ascribed to it. Chemistry is described in the introductory *Explication du système des connoissances humaines* as artificial research for the interior and occult properties of natural bodies, but here the meaning is evidently of the scientific sort desired by D'ALEMBERT. However, it is also stated that « chemistry has given birth to alchemy and natural magic ». And MAMOUIN, writing on alchemy, complains that « chemistry makes ungrateful use of the advantages she has received from alchemy; alchemy is maltreated in most chemical books »; and he distinguishes between the true alchemist and the charlatan. VENEL, in a long article on *Chymie* which has at least this much in common with the writings of the alchemists that it is muddy to the uninitiated, regards BOYLE as a mere physicist and longs for chemistry to come into its own and not be tied down by physics or subordinated to physics as the more general science.

L'*Encyclopédie* displays not a little scepticism on the subject of *materia medica*. The article on the cat warns us that while most authors of works of *materia medica* have recommended the use of different parts of the animal for this and that, not one of them has confirmed it by his own experience, and that it doubts « *ces prétentions de livre en livre* ». It adds, however, perhaps for our amusement, that one author enjoins that the sex of the cat employed be the same as the sex of the patient. The article on the dog, however, appears to be more credulous as to its medicinal properties. The oldwife's remedy of opening a little dog and applying it all hot to the head is characterized as « perhaps too neglected today » (57). Dog fat is recommended. The excrement of the dog is said to be used by apothecaries under the name *album graecum*, and in this case we encounter the old familiar suggestion that the dog be fed on bones. The recipe of stewing three new-born puppies in olive oil is given, but the comment is added that the only value of the puppies is their fat; that is, the attendant circumstances are really useless. The writer on the cabbage states that most of the medicinal properties ascribed to it by the ancients are today doubted, and that he is inclined to go still further and rank it only as a food and not

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(57) \* Ce remède de bonne femme, peut être trop négligé aujourd'hui ainsi que la plupart des applications extérieures, a produit quelquefois de bons effets... \*

as a medicine at all. On the other hand, the article *Cigogne* lists the use of various parts of the stork against poisons and the pest, for eye-troubles and other complaints. The Chevalier DE JAUCOURT rejects all that PLINY and PAUL OF AEGINA, VAN HELMONT and MULLER have said concerning the virtues of ear-wax as wretched stuff. « Let's tell the truth : that humour of the glands which appears from its consistency and bitterness a compound of wax and oil may have some slight cleansing, abstergent, and detersive quality » (58), but there are many better remedies of that sort. On the subject of poisons the contributor DAUBENTON, BUFFON'S « faithful lieutenant and squire at arms » (59), was quite sceptical, doubting, for instance, from his own experience and that of others who had worked with antimony without experiencing bad effects, if its vapors were poisonous, as most chemists and PARACELUS held (60), and also if spiders at least in France were poisonous except for inflaming the skin. VANDERNESSE added to this the comment, « The medical man treats the poison and sting of the spider a little more seriously than the naturalist », but he declares that experience does not support the belief that a spider's web is a specific against intermittent fever (61).

Yet the naturalist affirmed that little spiders grew at the same rapid rate whether they ate or not. According to his account they grow almost as you watch them. If they can catch a fly, they eat it, but they sometimes go for a day or two or even longer without being seen to take nourishment, « yet they enlarge always at the same rate, and their increase is so rapid that each day they more than double in size » (62). We are assured, however, that the chameleon does not live on air (63). It is a little discouraging to note that *l'Encyclopédie* still finds it necessary to enter into full and explicit denial of the old tale of the beaver's biting off his testicles to save himself from the hunters (64), when it had already repeatedly been

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(58) « Parlons vrai : cette humeur des glandes qui paroît par sa consistance et son amertume un composé de cire et d'huile peut avoir quelque médiocre qualité savonneuse abstergente détensive... »

(59) MORLEY (1878), I, 129-130.

(60) See article *Antimoine*.

(61) See article *Araignée*.

(62) *Ibid.*, « cependant elles grossissent toujours également, et leur accroissement est si prompt qu'il va chaque jour jour à plus du double de leur grandeur. »

(63) See article *Caméléon*.

(64) See article *Castor*.

shown false both in antiquity and the middle ages. And we find the article *Chameau* still citing SOLINUS to the effect that the camel has but one hump, and ARISTOTLE and PLINY to the effect that it has two humps and the dromedary only one. The article on the bat states that most authors have taken it for a bird, but that it is a quadruped (65). The long article on the carp and its anatomy is GALEN-like in regarding the marvelous structure of its parts as evidence of « the hand of the sovereign Artist ». Similarly the article *Coquillage* urges the study of such species in many different localities in order to gain « a new idea of nature's resources and of the sovereign Intelligence who is their Author » (66). The article on the brain gives the opinions of different authorities as to what part of the brain the soul resides in, and discusses whether the brain is necessary to life, citing the case of three children who were born without any, and one who was born without a head (67). Thus the marvels of animals have not entirely disappeared from *l'Encyclopédie*. On the other hand, of course, positive progress was being made and registered. For example, the article on coral (68) refers to the discovery of the coral insects in 1725 by PEYSSONNEL on the Barbary coast and to his subsequent investigation of similar species of so-called marine plants (madrepores, lithophytes, and sponges) at Guadeloupe, whence in 1753 he sent BUFFON and DAUBENTON a work in manuscript which they hoped soon to publish. In the meantime DAUBENTON quotes from DONATI'S *Della storia naturale marina dell' Adriatico saggio*, published at Venice in 1750.

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(65) See article *Chauve-Souris*.

(66) « Nous prendrons une nouvelle idée des ressources de la Nature et de la souveraine intelligence qui en est l'auteur. » BOURGUET, *Catalogue raisonné des Coquilles*, 1736, was, MORNET (1911), p. 7, notes, a very learned compilation found in many libraries.

(67) See article *Cerveau*.

(68) Sir JOHN HILL, in his translation of THEOPHRASTUS' History of Stones (London, 1746), with many learned notes, still agreed with THEOPHRASTUS that coral was a vegetable growing in the sea; « it were easy to overthrow all that has been advanced as to its belonging to animals or being of the mineral kingdom. » He also was behind *l'Encyclopédie* in accepting the deluge theory to account for fossils.

S. GÜNTHER, « Die Korallenbauten als Objekt wissenschaftlicher Forschung in der Zeit vor DARWIN, » *Bavarian Sitzb., Math.-Phys. Kl.* (1910), 14, states that SHAW, FORSKAL, and LINNAEUS agreed with PEYSSONNEL as to the animal nature of coral, but that RÉAUMUR, STATIUS, MÜLLER, and KLEIN opposed this view.



The old problem of animal psychology is touched on by D'ALEMBERT in the article *Forme substantielle*. DESCARTES had held that animals do not suffer pain but only seem to do so. This D'ALEMBERT rejects but cannot explain why other animals who have similar organs and sometimes keener sensations than man should not have attained the power of reflection and abstract ideas. He comes to the somewhat lame conclusion that we must be content to believe that beasts suffer, that our souls are spiritual and immortal, that God is always wise and just, and to remain in ignorance of the rest. The article on physiology by HALLER retains the old classification of the actions and functions of the human body as vital or natural or animal, but holds that everything which is purely corporal in man can be fully explained by laws of mechanics and physics, and that « the definition of the circle is no clearer in geometry than the light that often guides a wise (medical) practitioner » (69). « As for the mutual intercourse of soul and body it is not only the most inconceivable thing in the world but even the most useless to the medical man » (70). A cure is a change made in the human body by the action of other bodies, so the physician should attend solely to the body.

We are thus brought back again to the subject of medicine. The encyclopedists were none too well satisfied with the medical learning or practice of their time. In praising the Hippocratic collection in his article upon experimental method D'ALEMBERT said: « In place of those systems, if not murderous, at least ridiculous, to which modern medicine has given birth only to reject them shortly, one finds facts well envisaged and well put together; one sees a system of observations which still serves today and which apparently always will serve as a basis for the healing art ». Similarly the Chevalier DE JAUCOURT affirmed that no one had described cholera better than CAELIUS AURELIANUS and ARETAEUS or indicated a better treatment for it; that moderns added nothing, but rather too often deviated from the almost forgotten practice of the ancients in this disease (71). GALEN was perhaps mentally associated too closely with the despised middle ages to receive such unqualified praise. However, the article

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(69) « *Physiologie* »; « La définition du cercle n'est pas plus claire en Géométrie que les lumières qui guident souvent un savant praticien. »

(70) *Ibid.*, « Quant au commerce mutuel de l'ame et du corps c'est non seulement la chose du monde la plus inconcevable mais même la plus inutile au médecin. »

(71) See article *Choléra*.

*Galenisme* admits his personal greatness and sketches some of his life, but holds that he subjected medicine too much to general ideas and made it too easy — which explains why everybody followed him; that he made too much of the four qualities; and that his association of critical days with the stars or moon was erroneous. The article *Complexion* (in the sense of state of health or natural habitude of the body) rather apologizes for rehearsing the ancient fourfold division into temperaments: sanguine, connected with air, and hot and wet; phlegmatic, connected with water, and cold and wet; choleric or bilious, connected with fire, and hot and dry; melancholy, connected with earth, and cold and dry. « Not much attention is any longer paid to such divisions; experience has proved an eye-opener on many prejudices and opinions, of which it is nevertheless necessary to give an account, so that each person can accept or disregard them as he judges fit » (72). Yet we find VANDERNESSE arguing that a sea bath is the best remedy for mania because the qualities of fluidity, humidity, and heaviness are increased by the salt in the water, while the terror of the patient may excite a reaction which will restore his deranged imagination. And several experiences seem to show that a cold ducking is good for frenzy (73). Bleeding still remained a favorite medical procedure. The article on Phlebotomy enters upon arguments in justification of it that would put a scholastic to blush. When the blood is too viscous and slow-moving, blood-letting will enliven it and make it hotter; but in a plethora resulting from too great a quantity of spirituous aliment — the secretion of spirit goes on in the brain — or a diminution of transpiration, phlebotomy will make the blood circulate more slowly and refresh it. In the former case blood-letting by lessening the resistance in the blood-vessels will increase their contractive power; in the latter case it will have the opposite effect, since the heart and arteries will no longer contract so often and so vigorously as before. VENEL's article on climate disputes the medical theory that one ought to drink a great deal of water in hot climates in order to repair the dried-up blood, holding that to drink undiluted water there is very harmful, and that acids,

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(72) « On ne fait plus guère d'attention à toutes ces sortes de divisions : l'expérience a ouvert les yeux sur bien des préjugés ou des opinions, dont il faut cependant rendre compte, afin que chacun puisse en faire usage ou le mépris qu'il jugera à-propos. »

(73) See the article *Bain*, medical section.

spices, wines and spirituous liquors are much better and are more salutary in hot than in cold countries, although admitting that the *abuse* of strong liquors is more injurious in a hot climate. The article on wine repeats this contention, adducing the habits of the peasants of the *Midi*, and is also inclined to agree with HIPPOCRATES, DIOSCORIDES, AVICENNA, and the Stoics that it may be a good thing to get drunk occasionally.

A chief reason for the scepticism shown in l'*Encyclopédie* on the subject of *materia medica* was the advance being made in chemical knowledge. This was especially destructive to the elaborate compound medicines recommended in pharmacopeias, since it could be shown that some at least of their ingredients had properties which would nullify one another. Pharmaceutical chemistry for a considerable period before l'*Encyclopédie* had been reducing the vast number and reforming the constituents of these confections and electuaries, but had not gone far enough to suit VENEL (74). He says that of about thirty in the *Universal Pharmacopeia* of NICOLAS LÉMERY (1697) only three are now in usage in France, which three VENEL proceeds to describe and criticize. The *confection d'hyacinthe* as modified by LÉMERY contained 1 and 1/2 ounces of prepared hyacinth, although powdered sapphires and emeralds were now omitted; one ounce each of red coral, *terra sigillata*, and « *santal citrin* »; six gross of raspings of deer's horn; three gross each of bone from a deer's heart, root of tormentil, white dittany, dittany of Crete, saffron, myrrh, red roses, sorrel seeds, lemon, purslain; four scruples of crabs' eyes, and of the skins of lemons and sour oranges; ten grains each of ambergris and musk; one ounce of sirup of kermes; and three pounds — which VENEL criticizes as far too much — of sirup of carnation pinks. Another compound comes down, somewhat altered, from MESUË, and « old theriac » is still in use and not unfavorably regarded by l'*Encyclopédie* itself. Coral was employed as an ingredient in many other troches, pills, powders, opiates, and tablets than the confections above mentioned (75).

Willy-nilly, then, the encyclopedists still retained many conceptions of past science — and even of the medieval past which they scorned — which have since been abandoned. Their very chart of the departments of human knowledge (76) has a medieval character with

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(74) See his articles, *Confection* and *Electuaire*.

(75) See the article *Corail*.

(76) « *Système figuré des connoissances humaines*, » found at the beginning of the first volume after the « *Discours préliminaire* ».

its optic, dioptic, and catoptric, its classified prodigies and monstrosities of nature, its science of God and science of spirits, its pneumatology or science of the soul, its mention of falconry under zoology. The conception of four elements was far from having been completely abandoned, as we have seen, and the phlogistic theory of the principle of fire was, of course, still in force (77). The article, *Froid (Economie animale)*, opens with the statement that the element fire is found more or less in all bodies.

Inasmuch as the phlogiston theory continued through the century, and the nature of heat was not clearly understood until the middle of the nineteenth century, it is interesting to note the discussion of heat and cold in *l'Encyclopédie*. VENEL's article, *Froid (Physique)*, after giving and criticizing the views of ancient philosophers, says that most modern natural philosophers (*physiciens*) hold that in general cold is only less heat, and that the thermometer marks equally degrees of heat and cold. The article, *Chaleur*, states that some call heat a quality; others, a substance; others, a mechanical affection. BACON, BOYLE, and NEWTON are cited as conceiving of heat not as a property originally inherent, but produced mechanically within a body, while DESCARTES is quoted as saying that heat is the movement of the parts of a body.

But we must bring our account of *l'Encyclopédie* and its attitude toward science and related fields to a close. While it was inevitable in the circumstances of the case that it should sometimes take up an inconsistent position or halfway attitude, on the whole it shows a brave and intelligent and fairly well sustained effort to maintain a critical and scientific attitude, and to free itself from the errors and unwarranted prepossessions of the past. To those who regard its « philosophy » as shallow we may answer in the words that D'ALEMBERT used in defending the old Greek atomist from the charge of madness, words which not inaptly describe the spirit of *l'Encyclopédie* itself; « DEMOCRITUS a fool! He who, to say it here in passing, had, found the most philosophic way of enjoying both nature and mankind, that is, to study the one and to laugh at the other » (78).

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(77) For example, in the article *Charbon (Chimie)* by VENEL we read, « comme mixte inflammable fixe, il fournit au Chimiste le principe du feu ou le phlogistique. »

(78) « *Experimental* »; « DÉMOCRITE fou! lui qui, pour le dire ici en passant, avoit trouvé la manière la plus philosophique de jouir de la Nature et des hommes; savoir d'étudier l'une et de rire des autres. »



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The Blight of Pestilence on Early Modern Civilization

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## THE BLIGHT OF PESTILENCE ON EARLY MODERN CIVILIZATION

THE Black Death of 1348 was apparently by far the most fatal epidemic in the annals of Europe, with incalculable effects upon the flourishing civilization which had marked the preceding twelfth and thirteenth centuries. Enormous as was the toll of human life which was taken at its first appearance in Europe, this proved to be no assurance of future immunity. Though we are familiar with the statement that there were subsequent recurrences of the plague, we perhaps do not sufficiently realize the pest-ridden condition of Europe in late medieval and early modern times. Like a cancer the fell disease ate at the vitals of European civilization. Like an incubus it weighed upon the human imagination and spirit. Like some crawling venomous worm it has left its foul trail across the face of history. In many parts of Europe the population seems not again to have reached the density of the thirteenth and early fourteenth centuries until after the economic and industrial revolution of the eighteenth and early nineteenth centuries. Schools closed, and law-courts adjourned post-haste at the approach of the dread disease. All sorts of human activities were frequently interrupted, interfered with, and enfeebled. Thus the period that we have been too apt to glorify as an age of renaissance, of reformation, of discovery, was in many ways—for we must also remember the insane wars of religion and of ambitious monarchs—a time of setback, stagnation, distress, and abject misery.

It needs no very extensive reading or profound study to find many indications of the ever present importance of the pest from the fourteenth even to the eighteenth century. Once one begins to look for such signs, one seems to find them in almost every book on the period to which one turns. Perhaps it is in part because the late medieval and early modern period has been so commonly viewed from the standpoint of the rise of monarchy, kings being the best protected of all persons from the plague, that insufficient notice has been taken of the passing of ordinary humanity "at this poor dying rate". But when we turn to local histories of towns or provinces, to the records of schools and individuals, not to mention the history of medicine, we find many marks of the ravages of pestilence. It is the purpose of the present article to give some specimens of this evidence which seems to be available in such abundance. Of course,

other epidemics and contagions may sometimes have been confused with the bubonic plague, but in any case we are not so much interested now in tracing the effects of one particular form of disease as in noting the great part played by pestilence in general in the history of the time.

As the westward sweep of the Huns in the fourth and fifth centuries had been followed by a great pestilence during the reign of Justinian, after which the Byzantine Empire hardly again attained such wealth, prosperity, and power; so the westward sweep of the Mongols in the thirteenth century was followed by the Black Death in the fourteenth. In part it may have been responsible for the expansion of the Ottoman Turks and the final decline of civilization in the Balkan peninsula and Asia Minor. Those regions witnessed nine great outbreaks of the plague between 1348 and 1431, and "these dates coincide with the most aggressive period of Ottoman conquest".<sup>1</sup> In the West the great decrease in population may explain the triumph of centralized monarchy over local government and enterprise, and the rise of capital with the concentration of wealth in a few hands. But let us turn to more particular and demonstrable effects.

From Petrarch to Erasmus, whose respective experiences with the plague are perhaps too familiar to require repetition, we may find humanists bemoaning the effects or dodging the course of the plague. Dominicus Bandinus, a grammarian of Arezzo, in his work on Peoples, Buildings, Provinces, Cities, Islands, not only informs us that in the Black Death of 1348 he lost both his parents and all his brothers and sisters, but also mentions plagues of 1364, 1379, 1383, 1399, and 1400, in the last of which he lost his son.<sup>2</sup> Passing on to another generation and century and to a different field of learning, we may note the untimely death of Ludovicus Pontanus who had already made a great legal reputation for himself when, at scarcely thirty years of age, he died of the plague at the Council of Basel in 1439 within thirty-six hours after he fell ill. Though born in Spoleto, in the prologue of one of his works he speaks of himself as a Roman, and he is usually called Romanus, partly perhaps because of his proficiency in Roman law. Before he took up his

<sup>1</sup> H. A. Gibbons, *The Foundation of the Ottoman Empire* (1916), p. 96.

<sup>2</sup> See the account of the manuscript, S. Michael de Muriano, Venetiis, 22, fifteenth century, in Mittarelli's *Catalogue* of 1779. The *De Populis, de Aedificiis, de Civitatibus, de Insulis*, formed the fourth part of an encyclopaedic work, *Fons Memorabilium Universi*. As a rule I shall not treat of the effects of the Black Death in the fourteenth century, as its effect on men of learning then is being investigated by one of my students, Miss Anna Campbell.

residence in Rome, he had studied law at the universities of Perugia and Padua, and he had taught law at Siena before he was called to Rome. There he was not merely a professor, but Pope Eugenius IV. made him a protonotary and consistorial advocate. He was a close friend of Panormitanus<sup>3</sup> whom he accompanied to the council. Aeneas Sylvius, later Pope Pius II., both composed a poetical epitaph of over twenty lines in honor of Pontanus and, in his prose history of the Council of Basel, devoted a long passage to an account of his marvellous genius. Pontanus remembered everything that he had ever heard or read. Instead of citing laws by their opening words in the customary manner, he would quote the entire text from memory. He was a man worthy not of Rome merely but of the sky and to whom it seemed that no one of mortals was comparable.<sup>4</sup> Though scarcely thirty at the time of his death, he had already written a commentary on the Code and Digest, a volume of *Consilia* and another of *Singularia*, as well as *Repetitiones* and *Responsa*.<sup>5</sup> Thus the plague cut short a career not merely of great promise but of great achievement. Another legal authority to die of the plague was Raphael Fulgosius in 1427 after teaching law for twenty years at Padua.<sup>6</sup> It has been disputed whether Johann Müller of Königsberg, whence his Latin name, Regiomontanus, the great mathematician, died at Rome in 1475-1476 of plague or whether he was assassinated by the sons of George of Trebizond, whose errors in translating Ptolemy he had mercilessly laid bare. Giovanni Cotta da Verona (1481-1509), a poet whose admirers represented him as a second Catullus, died of the pest on his way to Rome to beg Julius II. to liberate his protector, Bartolommeo d'Alviano.<sup>7</sup> Robert Gaguin, the leading name in French humanism of the fifteenth century, had more than one encounter with the plague. In 1466-1467 he remained at his studies while it raged in

<sup>3</sup> Otherwise Nicolaus Siculus, archbishop of Palermo. He was a great figure at the Council of Basel. Earlier, in 1425, he had taught canon law at Siena.

<sup>4</sup> Lib. I. *de Conc. Basil.*: "erat memor omnium quae ipse unquam aut legisset aut audisset, nec ut ceteri jurisconsulti principia legum in disputando allegabat sed quasi codicem legeret sic textum memoriter recitabat. Vir non Roma tantum sed coelo dignus et cui nemo mortalium comparandus videtur; non admirationi sed stupori futurus omnibus si ut aequum videbatur aetatis tempora duplicasset."

<sup>5</sup> For Pontanus I have followed the accounts of Fichardus (Joannes, Francofurtensis), *Vitae Recentiorum Jurisconsultorum* (Padua, 1565), fols. 12r-13r; and Giuseppe Caraffa, *De Gymnasio Romano* (Rome, 1751), pp. 401-402.

<sup>6</sup> A note added to a Venetian manuscript, S. Marco IX. 20, informs us of his death. S. Marco IX. 5 contains his glosses on parts of the *Digest*; S. Marco IX. 57 and IX. 206 contain *Consilia* by him.

<sup>7</sup> Fr. Fiorentino, *Il Risorgimento Filosofico nel Quattrocento* (Naples, 1885), pp. 270-271.



Paris; in 1484 it obliged him to retire to his country house; in 1499 most of the doctors of decretals left the plague-stricken city, but Gaguin as dean stayed on.<sup>8</sup>

Aeneas Sylvius had closer contacts with the pest than his passages just mentioned on the untimely death therefrom of Pontanus. As he tells us in the *Commentaries* written after he had become pope, he was one of a family of twenty-two children. There were ten still in the home when pestilence killed all except himself and two sisters.<sup>9</sup> When Aeneas was in Germany about 1438, he saw famished children in Bavaria fight like dogs for bits of bread that were thrown to them. Not long after followed a very fatal plague which infested all Germany, killing many prelates as well as the aforesaid Pontanus, called "the light of the law". At Basel more than three hundred bodies were buried in a day. Aeneas lost his dearest friends, Julianus Romanus and Arnoldus Theutonicus, remaining with them to the end. Then he himself became infected and told his comrades to leave him and save themselves. One, whom he names, took this advice, but others were more constant. Aeneas naturally wished to procure the attendance of the best doctor possible. There were two celebrated physicians then present in Basel: one was a learned graduate of Paris but irreligious; the other was a pious but uneducated German. "Aeneas preferred piety to science", and was cured in this wise. Since the left side of the groin was affected, he was bled from the vein of his left foot. He was forbidden to sleep for an entire day and part of the night, and drank a powder, the composition of which his physician refused to reveal. Pieces of a green frog and bits of damp Cretan earth were applied to the infected places. The immediate effect of this treatment was to make Aeneas feel worse; he called in a priest to hear his confession, and the report spread that he was dead. But after six days he recovered and paid his doctor six pieces of gold. The conscientious physician protested that the fee was too large and that he would treat six poor patients gratis in return.<sup>10</sup> There are yet other references to the pest in Pius's *Commentaries*. About 1450 it was raging so in Prague that the national gathering of the Bohemians had to be transferred to another town.<sup>11</sup> And after he became pope, on

<sup>8</sup> See the *Notice Biographique* prefixed to Louis Thuasne's edition of his letters and orations: *Roberti Gaguini Epistolae et Orationes*, I. (1903).

<sup>9</sup> *Commentarii Pii II.*, edition of 1614, liber I., p. 2, "Ex ea Silvius duodeviginti liberos sustulit, non tamen ultra decem simul aggregavit; quos urgente inopia Cor-siniani quod est oppidum vallis Urciae nutrit: sed omnes tamen iniqua lues extinxit, duabus tamen sororibus Laudomia et Carhenia cum Aenea superstitibus."

<sup>10</sup> *Ibid.*, pp. 7-8.

<sup>11</sup> *Ibid.*, p. 17.

one occasion the pest drove the papal court away from Viterbo.<sup>12</sup>

Let us take another glimpse at the effects of the pest on learning in the case of the circle of German humanists and men of letters in and about Strasbourg during the closing fifteenth and early sixteenth century. Peter Schott was forced to discontinue temporarily his legal studies at Bologna by the outbreak of the pest there in 1478, and to postpone his visit to Rome for a year because of pestilence there in the winter of 1480-1481, while the report that plague was raging in Paris kept him from going there in 1483 to pursue the study of theology. Alas! all this avoidance at best but slightly delayed his end; in 1490 he died of an epidemic at the age of only thirty-two.<sup>13</sup> The very next humanist listed in Schmidt's *Literary History of Alsace*, Sebastian Murr, died of the pest in 1495.<sup>14</sup> Jodocus Gallus (1459-1517), having in 1470 lost several members of his family in a pest, was received as a boy into a Franciscan convent and educated by that order, which first sent him to school at Schlestadt, then to their convent at Basel, and then to the University of Heidelberg.<sup>15</sup> Jacques Han died in 1510 of an older contagious disease, leprosy. It required the special intervention of the Emperor Maximilian on his behalf to induce the town magistrates to relax the rigid rule, that all lepers must go to the lazaret-house outside town, sufficiently to allow him to continue his studies in his own house under strict quarantine.<sup>16</sup> Thomas Wolf (1475-1509), who in 1506 had been very ill from syphilis (*morbis Gallicus*) according to his own statement, died suddenly at Rome at the age of only thirty-four while on his second visit to Italy.<sup>17</sup> In his Commentary on the Fourteenth Psalm he had attributed "these calamities, these new diseases, these pests, these sudden deaths, these revolutions in empires that frighten us so", to the growing secularism of the age and to the increasing tendency to deprive the clergy of the property, immunities, and honor which were their ancient due.<sup>18</sup> An outbreak of the pest at Strasbourg in 1511 forced the printer who was publishing a book for Matthias Ringman (Philesius) to move his press to Baden and issue the work there. In the same year Ringman dedicated another publication, four plays of Plautus, to a man who had fled from the plague at Remiremont. And in the same

<sup>12</sup> *Ibid.*, lib. VIII., p. 211.

<sup>13</sup> For these facts in Schott's career see Charles Schmidt, *Histoire Littéraire de l'Alsace à la Fin du XV<sup>e</sup> et au Commencement du XVI<sup>e</sup> Siècle*, tome II. (1879), pp. 6-7, 10, 12, 32.

<sup>14</sup> *Ibid.*, p. 39.

<sup>15</sup> *Ibid.*, p. 41.

<sup>16</sup> *Ibid.*, pp. 49-50.

<sup>17</sup> *Ibid.*, pp. 78, 85-86.

<sup>18</sup> *Ibid.*, p. 83.

year he himself died at only twenty-nine of tuberculosis which may have been aggravated by the prevailing pest.<sup>19</sup> In the winter of 1527-1528 the students of the school at Hagenau were dispersed by the pestilence, but this enforced vacation gave the master, Gebwiler, the necessary leisure to push two works on to publication.<sup>20</sup>

The Brethren of the Common Life, to whom so large a part has often been assigned in the religious and intellectual life of the pre-Reformation period, did not remain untouched by the plague. In fact, their founder, Gerard Groot, had died of it in 1384 while yet in his early forties. Visiting the bedside of one of his followers who was plague-stricken, he touched the patient's pulse and immediately felt the contagion ascend from the tips of his fingers to his armpit and began to sicken. Again in 1419 some of the brethren died from plague when it broke out in Zutphen, and in the obituaries of members of the order given by Ralph Dier de Mudén are several cases of death from the pest.<sup>21</sup>

But perhaps the most impressive single source for the disastrous effect of the plague upon humanists and men of learning is the work of Giovan Pietro Bolzani of Belluno (1477-1558) upon the misfortunes of Italian men of letters of his own time, especially in connection with the sack of Rome in 1527.<sup>22</sup> Of some one hundred and eleven persons of whom he treats no less than fourteen died of the pest. These include Hermolaus Barbarus, Franciscus de Accoltis, bishop of Ancona, Antonius Marosticus, many of whose writings left in manuscript had to be burned to avoid contagion, as was also the case with Christopher Batti of Parma. Another man, who had tutored Giulio de' Medici in grammar and oratory the year before he became Pope Clement VII., contracted the plague by returning to his infected house, where servants had died of the pest, in order to rescue his writings. Other fatalities were Rodericus Lusitanus, a mathematician of note and Greek scholar; Josiphon, son of the physician of Julius II. and a student of philosophy,

<sup>19</sup> Schmidt, *op. cit.*, II. 127-129.

<sup>20</sup> *Ibid.*, p. 170.

<sup>21</sup> *Scriptum Rudolphi Dier de Mudén de Magistro Gherardo Grote, Domino Florencio, et Multis Aliis Devotis Fratribus* (published by G. Dumbar, *Analecta sive Vetera aliquot Scripta Inedita*, Deventer, 1719), I. 10, 77-78, etc.

<sup>22</sup> *Ioannis Pierii Valeriani Bellunensis de Litteratorum Infelicitate Libri Duo*, first printed at Venice, 1620. I have used the reprint from this edition with further notes and additions by Sir Egerton Brydges (Geneva, 1821). References to the plague are also numerous in the *Lives of Illustrious Men of the Fifteenth Century* of Vespasiano da Bisticci, the Florentine manuscript dealer. See *The Vespasiano Memoirs*, now first translated by W. G. and Emily Waters (1926), pp. 35, 52, 271, 274, 279, 310, 369, 422.

mathematics, Greek, and Hebrew; Julius Doionus, who taught medicine for a while at Padua; Laomedon Tardolus, a young jurist of promise; Dominicus Sarratoni, a philosopher and mathematician of Venice; and Georgius Sauromanus, a German scholar then at Rome.

In order to obtain some idea of the disturbance wrought by the plague in early modern times in what is now France, let us first begin from the year 1450 an examination of Devic and Vaissette's monumental history of Languedoc<sup>23</sup> in search of signs of the plague's ravages in that region. Since this history was based largely upon the official records of the local Parlement and Estates, our findings will be similarly limited. They are, nevertheless, sufficiently impressive. In 1451 the Archbishop of Toulouse died of the plague, and because of it the court of justice at Nîmes had to be transferred to Bagnols from May, 1450, to February, 1451.<sup>24</sup> Eight years later, when the Estates of Languedoc were asked for grants of taxes, they complained that a third of the population had lacked bread for three years past, and that during the last decade the pest had reduced the population one-third.<sup>25</sup> In 1463 a fire that started in the house of a baker consumed three-fourths of the city of Toulouse. The enraged citizens condemned the baker and his wife to death, and, although they were pardoned by the king, Louis XI., who chanced to be present at the time, they died of fright. Louis, indeed, acted on this occasion in a fashion unusually to his credit, for he is further said, not only to have been moved to tears by the fire's ravages, but, under the stress of the emotion of the moment, to have exempted the city from the *taille* for one hundred years. The misery occasioned by the fire was perhaps responsible for a recurrence of the plague in September of the same year which forced the Parlement to adjourn its sittings from Toulouse to Béziers.<sup>26</sup> In 1465 the pestilence compelled the courts of justice in the sénéchaussée of Beaucaire to suspend sittings for seven or eight months.<sup>27</sup> In 1472 it obliged the Parlement to retire to Albi, and then, after only three days spent there, to move on to Réalmont. In 1474 the Parlement was again compelled to take to flight twice,

<sup>23</sup> Cl. Devic and J. Vaissette, *Histoire Générale de Languedoc*. In the new and enlarged edition of 1889, volume XI., with which we begin, corresponds to volume V. of the original edition. My following citations, however, will be by book and chapter, and so correspond to either edition.

<sup>24</sup> *Ibid.*, bk. 35, ch. 19.

<sup>25</sup> *Ibid.*, ch. 31.

<sup>26</sup> *Ibid.*, ch. 45.

<sup>27</sup> *Ibid.*, ch. 50.

while at Toulouse the plague was accompanied by famine.<sup>28</sup> In 1478 the Estates had to meet in a small town because all the large ones were plague-stricken, and at their meeting of 1482 they made allusion to the poverty and misery of the pest-ridden land.<sup>29</sup>

The sixteenth century told the same tale. Nîmes suffered from some terrible contagion in 1501, and troops spread it to Montpellier in 1503. Meanwhile, in 1502, the pest desolated both Provence and Languedoc. The Parlement had to leave Toulouse, but the pest followed it to Muret, then to Lavaur, then to Gaillac. Finally the judges took refuge at Grenade-sur-la-Garonne. By November the pest had stopped and they returned once more to Toulouse. But in 1506 three thousand persons died of the plague at Toulouse, and the Parlement finally had to abandon the city. Again in 1521-1522 there was pest, especially at Toulouse, and followed by famine. This time the Parlement did not return until 1523. Once more in 1527 came plague and famine which continued into the following year, with Parlement finding a refuge only at Grenade-sur-la-Garonne.<sup>30</sup> Thus it went through the century, with several years of famine and pest following the Wars of Religion at the beginning of the seventeenth century.<sup>31</sup> Then in 1629-1630 some 5500 persons died of the plague at Montauban, and 50,000 in the next year at Toulouse, though it would seem that this figure must be exaggerated.<sup>32</sup>

That the menace of the plague continued in southern France into the eighteenth century is indicated by the fact that the holder of the bishopric of Nîmes from 1710 to 1731, in a sermon delivered in the cathedral when the pest was threatening, assured his flock that he would not desert them.<sup>33</sup> Or in a manuscript at Avignon we may read "A Journal of What Happened" in that town "from the time of the last pest beginning August 14, 1721, and ending January 31, 1723".<sup>34</sup> It was the prevalence of plague at Marseilles in 1720-1721 and the fear lest it spread to London that led Defoe to write his *Journal of the Plague Year* recording the great plague in London in 1665. In the early eighteenth century at Avignon when land was set aside for a botanical garden which had hitherto been reserved for those afflicted with the plague, it was provided that

<sup>28</sup> Devic and Vaissette, *op. cit.*, bk. 35, ch. 74.

<sup>29</sup> *Ibid.*, chs. 82, 86.

<sup>30</sup> *Ibid.*, bk. 36, chs. 47, 51, 59, bk. 37, chs. 8, 23.

<sup>31</sup> *Ibid.*, bk. 42, ch. 24.

<sup>32</sup> *Ibid.*, bk. 43, ch. 40.

<sup>33</sup> Dreux du Radier, *Bibliothèque Historique et Critique du Poitou* (Paris, 1754), IV. 472.

<sup>34</sup> Avignon MS. 2793 (fonds Requien), eighteenth century, 133 fols.

they might still have the use of it whenever pestilence invaded the city, while the university should use it for botanical purposes the rest of the time.<sup>35</sup>

Turning from Languedoc to other regions of France and going back again to 1451 as a starting-point, we may note in the case of Burgundy some instances of the measures of police and medical regulation that were evoked by the repeated menace of the plague. Similar measures were adopted sooner or later elsewhere, but the whole subject is too vast for us to more than touch on here. In 1452 the dyers were ordered to carry on their trade outside of Dijon in order to avoid putrefaction within the town. In 1457 it was decreed that the bodies of strangers who died of the pest and those of persons who had been hanged must be buried promptly. In 1467 tramps were expelled from town. The year before, a committee of doctors had drawn up a treatise of preventive medicine against the plague. From that time on at Dijon there was police regulation aiming at the isolation of contagious cases and the suppression of beggars, a class especially likely to harbor and spread the pest. There were also measures of sanitation and hygiene directed against dung-heaps, washing soiled linen within the town, emptying slops in the street or burning straw mattresses there, and against keeping pigs, pigeons, and the like. Infected houses were to be fumigated; in some cases the furniture was to be burned. The slaughter of animals and sale of meat were also regulated. Gradually there was developed a special personnel to care for those having the plague, and we hear of special "apothecaries of the pest". Plate VI. of Baudot's history of pharmacy in Burgundy shows us "Le Médecin de Peste" in protective armor with a baton to keep off the public in one hand, and a box of perfumes, no doubt intended to keep off the pest, in the other.<sup>36</sup> In the seventeenth century the pest was still one of the chief matters treated in the statutes of the gild of apothecaries.<sup>37</sup>

In the province of Berry there were outbreaks of the plague in 1458, in 1474-1475, and so on at intervals into the seventeenth century.<sup>38</sup> When on July 25, 1580, news came to Bourges that Paris was afflicted with the plague, the doctors, apothecaries, surgeons, and barbers were promptly convened. They reported that the sick were numerous in Bourges, but that as yet there were no cases of the

<sup>35</sup> L. Bardinet, *Universitatis Avenionensis Historica Adumbratio* (1880), p. 45.

<sup>36</sup> A. Baudot, *Études Historiques sur la Pharmacie en Bourgogne avant 1803* (1905), p. 158 et seq.

<sup>37</sup> *Ibid.*, p. 223.

<sup>38</sup> Louis Raynal, *Histoire du Berry* (1844-1847), vols. III. and IV.

plague. As preventive measures they ordered that the streets be cleaned, that all unclean animals be driven out of town, that no one from any pest-ridden place be admitted, that the sale of such fruits and vegetables as melons and cucumbers be forbidden. As soon as any cases of the plague occurred, they should either be quarantined in their own houses or put in the pest-house. These measures seem to have saved Bourges from the plague for two years, though it was raging in other towns of the province. Finally, in June, 1582, it broke out in Bourges. The mayor and échevins loyally remained at their posts, while many barbers and surgeons either left town or perished in the discharge of their duties. The clergy of the town, with the exception of the Jesuits, made a sorry showing. It became necessary to build a number of hasty additions to the pest-house, and further to pass severe measures against the prevalence of immorality, disorder, and blasphemy among the persons confined there. When plague again broke out in Bourges in 1628 six thousand of the inhabitants fled, and five thousand of those remaining died. Only one professor remained at the university, a doctor of medicine who displayed much courage throughout the epidemic. Only nine clergymen remained to receive the confessions of the dying and bring them religious consolation; namely, four Jesuits, four Capuchins, and one secular priest. Of these, two Jesuits died of the plague.<sup>39</sup> The Jesuits also rendered notable services in the pest of 1580-1581 at Paris,<sup>40</sup> and after 1565 they were allowed to take over the municipal college at Lyons because of the devotedness of two Jesuit fathers during the plague there.<sup>41</sup>

In Touraine of the later fifteenth and early sixteenth centuries occurrences of the pest were as regular as inundations of the Loire, with which they alternated. There was pest in 1471 and again in 1473, when the Morality of Sainte-Barbe had to be postponed on that account. In 1482 came a hot fever and *raige de tête*; those afflicted by it ran mad through the streets, dashing their heads against walls or plunging down wells. Giraudet suggests that it may have been meningitis due to malnutrition. The reign of Charles VIII. was marked in Touraine by both the pest and syphilis; the early years of the sixteenth century by pest, famine, and flood; the opening of the reign of Francis I. by pests of 1519 and 1522.<sup>42</sup> Nor

<sup>39</sup> For the outbreak of 1582, see Raynal, *op. cit.*, IV. 158-160; for that of 1628, *ibid.*, pp. 278-279.

<sup>40</sup> Du Boulay, *Hist. Univ. Paris.* (1665-1673), VI. 869.

<sup>41</sup> Delandine, *Catalogue des MSS. de la Bibliothèque de Lyon* (1812), pp. 8-9.

<sup>42</sup> The foregoing details in this paragraph are taken from the first volume of E. Giraudet's *Histoire de Tours* (1873).

did the pest cease to visit Tours in the later sixteenth and the seventeenth century.<sup>43</sup>

Turning next to Brittany, we centre our attention upon the city of Nantes in the sixteenth century.<sup>44</sup> In 1501 the pest killed four thousand, at least one-tenth of the population. It returned in 1522 and 1523. In 1525 grain was high-priced; in 1527 there was famine; in 1529 there was cold and damp weather and extreme misery. As usual, an epidemic followed, which grew so serious that in 1530 the death penalty was enacted for infected persons who appeared in public. In the years 1532-1535 syphilis was added to the previous epidemic. The pest came again in 1546, in 1549, and in 1553. When, in 1569, the Loire rose twenty-one feet, another outbreak of the pest followed the inundation. It was some slight compensation and consolation that in the meantime leprosy had so disappeared that in this same year, 1569, the hospital for lepers was empty and its revenues could be joined to those of the great hospital.<sup>45</sup> In 1583 elaborate police regulations were adopted to check the pest,<sup>46</sup> yet it recurred in 1586, 1596, 1602, 1603, 1612, 1624, 1625, 1631, 1632, 1637, and 1662. The epidemic in 1602, however, appears to have been typhoid dysentery.<sup>47</sup> Despite these frequent visitations, the population of the town appears not to have diminished.

In Lorraine, on the other hand, the population notably diminished during the first half of the sixteenth century, when there were spells of the bubonic plague or other epidemics in 1504, 1505, 1507, 1508, 1522, 1524, and 1545.<sup>48</sup> This period also witnessed a marked decline in learning.<sup>49</sup> But in the second half of the century the population increased rapidly despite pestilences in 1574, 1585, 1587, 1594, and 1597.<sup>50</sup> However, the absence of pestilence from 1545 to 1574 may have helped.

Romier, in his recent work on France under Catherine de' Medici, gives us a brief cross-sectional view of the pest's ravages in mid-sixteenth century.

<sup>43</sup> See Giraudet's second volume, chapters XVIII. and XIX.

<sup>44</sup> For the following details see A. Guépin, *Histoire de Nantes* (2nd ed., 1839), p. 195 *et seq.*

<sup>45</sup> *Ibid.*, p. 236.

<sup>46</sup> *Ibid.*, p. 197, where the regulations are given in detail. They included such provisions as that every house must have its own latrine, and that any householder who did not keep the pavement in front of his house clean should be fined.

<sup>47</sup> *Ibid.*, p. 290. For the difficulty that the town government of Nantes, like that of Dijon, had in securing the services of doctors and surgeons to tend the pest-ridden, see pp. 267-268, 291, etc.

<sup>48</sup> Aug. Digot, *Histoire de Lorraine* (2nd ed., 1880), IV. 105.

<sup>49</sup> *Ibid.*, IV. 123.

<sup>50</sup> *Ibid.*, V. 53.



Since 1547 the pest had carried off in Limoges and its suburbs six or seven thousand persons. It passed from one province to another, taking on suddenly an acute form. It raged thus from Picardy to Languedoc, and even at Paris, during the first years of Henry II. Then came the horror of the years 1556, 1557, and 1558, during which the pest together with famine decimated the population of the realm. At Toulouse and in Quercy there were twenty-five thousand victims. The little town of Carcassonne lost two thousand souls. The survivors fled. The evil, which then reached almost all the provinces, seemed to decrease for a time after, to revive with the more force when civil war had created new woes. In 1563 six thousand more died at Limoges, four thousand at Loudun, and the following year the inhabitants of Lyons had not enough hands to bury the corpses. Charles IX., then visiting his kingdom, sought vainly for a refuge from the pest, that terrible traveller which seemed to await him at the gate of every town.<sup>51</sup>

At Bordeaux the students of the College of Guienne were dispersed by the pest in 1549 and again in 1555. In 1585 the plague killed 14,000 persons, including two leading teachers at the college which once again had to be closed, while the local Parlement fled elsewhere. Again in the seventeenth century the pest closed both the College of Guienne and the Jesuit college from 1646 to 1648.<sup>52</sup> Even the great University of Paris was brought to a complete standstill by a visitation of the pest, as we learn from an oration delivered in December, 1545, by the celebrated Ramus, who was among the first to return after the pestilence. He recalls how daily before their eyes were funerals of persons of every age, sex, and fortune, young and old, men and women, rich and poor, with no hour of the day or night free from groans and grieving. Many students, many doctors, and some heads of schools perished. The royal professors were driven from their chairs by the fear of so great an evil and took to flight, as did all their disciples, leaving Paris to silence and solitude. Ramus goes on bemoaning the loss of friends and the sad state of affairs, and admits that it seems the height of temerity to try to reopen a school of letters in such a scarcity of students and with solitude reigning in all the academic precincts.<sup>53</sup> He was again

<sup>51</sup> Lucien Romier, *Le Royaume de Catherine de Médicis: la France à la Veille des Guerres de Religion* (1922), II. 65-66.

<sup>52</sup> Ernest Gaullier, *Histoire du Collège de Guyenne* (Paris, 1874), p. 226 etc.

<sup>53</sup> Pierre de la Ramée, *Pro Philosophica Parisiensis Academiae Disciplina Oratio* (1551), pp. 287-289. After stating that it is some time since he had last appeared on the public platform, "partim quarundam commentationum occupatione, partim impendentis periculi metu . . . cum longissime ab hac academia propter urbis pestilentiam abessem", Ramus proceeds: "Vidimus academiam quae paulo ante florentissima fuerat exitiali pestilentia afflictam. Quotidiana erant ante oculos omnis aetatis sexus fortunae juvenum senum virorum mulierum locupletum inopum funera; nulla tum erat hora diei noctisve lugubri gemitu vacua. Multi pueri plerique doctores nonnulli gymnasiarchi (ne domesticos luctus sileam) in gymnasiis

to encounter the plague at close quarters while in Geneva, where it killed his printer and forced Ramus to change his lodgings and soon afterwards to leave for Lausanne.<sup>54</sup>

In England the University of Oxford had already suffered cruelly from the plague before the time of Ramus. In 1485, Wood tells us in his *History of Oxford*, "a strange and unheard of sickness" within a few weeks' time "dispersed and killed most of the scholars". Next year came another visitation, and yet others in 1493, 1509, 1517, and, above all, 1528-1529.<sup>55</sup> Rents fell badly, and streets that formerly were populous became deserted. Though the university authorities, in writing in 1523 to Sir Thomas More, complained that the nobility, clergy, and monasteries had ceased to support them financially and to send them students, it was probably in no small measure, directly or indirectly, a result of frequent visitations of pestilence that they could say: "So is the number of scholars diminished. So our halls fall down. So all liberal customs grow cold. The Colleges alone persist."<sup>56</sup> This was equivalent to saying that there were almost no advanced or mature students in attendance.

At about the same time the University of Vienna was even harder hit by the plague. Ever since 1436 the pest had proved troublesome, and in 1482 the institution had thought of building a hospital of its own for the students. New attacks of the pest followed in 1506 and 1510, while in the year 1521 because of the plague not a single student matriculated. It broke out again in 1527, and, what with Lutheranism and the Turks at the gates of Vienna, the university never got its students back. In 1530 there were only thirty in attendance. Practically defunct, the university was then revived as a state institution by Ferdinand's reform decrees of 1533, 1537, and 1554.<sup>57</sup> Were we to hark back to the fifteenth

suis miserabiliter extincti. Pulsi sunt e cathedris metu tanti mali professores Regii fugatique sunt e scholis una cum discipulis magistri; bonae artes omnes ac literae uno illo miserabili calamitosoque tempore Lutetie conticuerunt. . . . Temeritatis summae esse videbitur literarum ludum aperire in tanta discentium paucitate . . . in omnibus academiae regionibus solitudo." His using the word "boys" (*pueri*) for the students indicates that most of them were then pursuing in the colleges about the equivalent of our preparatory school work. This was the grade of instruction to which Ramus largely devoted himself.

<sup>54</sup> K. Waddington, *Ramus, sa Vie, ses Écrits* (1855), p. 213.

<sup>55</sup> These dates approximately coincide with those given for the visitations of the English Sweat. C. Creighton in Traill, *Social England* (unillustrated edition), III. 256, lists five epidemics of the sweating sickness, two in the reign of Henry VII. and the others in 1517, 1528, and 1551.

<sup>56</sup> Sir Charles Edward Mallet, *A History of the University of Oxford* (1924), I. 410-411, citing Wood, I. 642.

<sup>57</sup> Rudolf Kink, *Geschichte der Universität zu Wien* (1854), I. 226-227.

century, we should find at the University of Montpellier a statute of 1410 bemoaning that as a result of war and pest "this university has often been desolate and deserted", while a statute of 1468 states that the university still has few students and "daily hastens to its ruin".<sup>58</sup> In the next century we find that war and pest in the 1580's had to a great extent disorganized the school of medicine.<sup>59</sup>

We may adduce only a few other instances of the interruptions of university instruction and dispersal of students by the pest, although doubtless many other examples might be found. In 1553 pest dispersed the students of Heidelberg, some of whom thereupon followed their professor of civil law to the University of Bourges.<sup>60</sup> A parallel case was when Pierre de Rebuffe, who was born in 1487 near Montpellier, after teaching for seven years at Toulouse, was driven by the plague to Cahors, whither he was followed by a crowd of students.<sup>61</sup> The University of Grenoble had been reconstituted in 1547, but then suffered from internal dissensions, the wars of religion, and the occupation of the town by the ferocious Baron des Adrets. Then the town was desolated by the pest in 1564, and as a sequel in 1567 the university was once again fused with that at Valence. Because of an epidemic the University of Avignon ran into debt and failed to pay in full the salary of the great jurist and humanist, Alciati, who accordingly went back to Italy, although he had left it not long before to avoid the wars that were there waging.<sup>62</sup>

It seems evident that the intellectual class, made up to a large extent of teachers and students (whose poverty, however, might render them more susceptible) and, at least in France, of the legal magistracy associated with law courts and parlements, was in a better position to evade the pest by migration than were the ordinary townsmen who had no other residence and whose native town was at once their home, country, and nation. The clergy and members of the medical profession were more in duty bound to remain at their posts, but, as we have seen, in fact they were often among the first to flee. In the sixteenth century this was one of the complaints made by the consuls of Montpellier against the wealthy and tax-exempt professors of medicine.<sup>63</sup> Antoine Fiancé, however,

<sup>58</sup> *Cartulaire de l'Université de Montpellier*, I. (1890) 50.

<sup>59</sup> *Ibid.*, p. 110.

<sup>60</sup> Louis Raynal, *op. cit.* (1844-1847), III. 414. For other instances of the effects of the plague at Heidelberg see E. Stübler, *Geschichte der Medizinischen Fakultät der Universität Heidelberg, 1389-1925* (1926), pp. 6-7, 17, 49, 51, 58.

<sup>61</sup> Raynal, *op. cit.*, III. 367.

<sup>62</sup> *Ibid.*, p. 368.

<sup>63</sup> *Cartulaire de l'Université de Montpellier*, vol. II. (1912). pp. lxxvii-lxxviii.

who had been educated at Montpellier, who wrote the satire *Platopodologia* against the envious practitioners of Carpentras, and who then practised medicine at Arles, subsequently rendered great assistance in the plague at Avignon regardless of his own safety and died of the plague in 1580 while still quite young.<sup>64</sup> Another physician who did not flee from the plague and who fell a victim to it was the famous Conrad Gesner (1516-1565), whose *Historia Animalium* has often been represented as "the starting-point of modern zoology". A polyhistor as well as naturalist, he not only published works on plants and animals, but a bibliography of writers in Greek, Latin, and Hebrew (*Bibliotheca Universalis*), a summary of all knowledge (*Pandectae Universales*), and an account of one hundred and thirty different languages (*Mithridates de Differentiis Linguarum*). For a time he was professor of Greek at Lausanne, but he was public physician in Zurich when the plague broke out there in 1564. He remained to combat it that year and the next, when he himself died of it not yet fifty years of age. If the doctors of municipal hospitals in France at about the same time did not flee, they did demand ten or fifteen times their normal salary for caring for the afflicted during a spell of the plague: "6900 francs at Orléans in 1602, 9250 francs at Montélimar in 1586, and 11,700 francs at Perpignan in 1592."<sup>65</sup> The values are given in the purchasing power of the franc in 1913. But concerning Paris in 1631 Gui Patin tells us that there is no doctor in the hospitals for the pest, the care of such patients being in the hands of "ignorant barbers".<sup>66</sup>

As for the clergy, even pope and cardinals had to reckon with the pest, as the *Commentaries* of Pius II. have already shown us, and as we learn further from the correspondence of his younger kinsman, Jacopo Piccolomini, cardinal of Pavia. A letter by him to Pope Paul II. of July 10, 1467, informs that pontiff that the plague had forced the writer to leave Pienza for Siena.<sup>67</sup> A year later he is much concerned for Paul II.'s own safety, pointing out that members of the papal family and household have already died

<sup>64</sup> L. Bardinet, *Universitatis Avenionensis Historica Adumbratio* (1880), p. 42.

<sup>65</sup> Vicomte Georges d'Avenel, *Les Revenus d'un Intellectuel de 1200 à 1913* (1922), p. 188. He adds: "Les municipalités, il est vrai, forcées de subir ces prix pour n'être pas abandonnées de leurs praticiens, stipulaient alors un tarif au mois ou à la journée."

<sup>66</sup> *Ibid.*, p. 192.

<sup>67</sup> Ep. CCV., in the collection bound with the *Commentarii* of Pius II. in the edition of 1614: "Vehemens pestilentia que his proximis diebus Pientiam et vicina loca apprehendit, coegit me Senam recta via contendere. Itaque hic sum cum famuliola incolumis."

of the plague, and that Paul should no longer remain in the pest-ridden city and expose his precious person to danger unnecessarily. The cardinal adds the further warning that antidotes and doctors are of no avail against the dread disease.<sup>68</sup>

It is probable that, as the rich and well-housed and well-fed were less liable to the pest than the poor, so the intelligent and well-educated knew how to escape it better than the stupid and ignorant. Girolamo Ruscelli, indeed, who was at once philosopher, poet, and physician, flattered himself that he had preserved himself from the pest in 1556 in Padua and neighboring places by means of "odoriferous balls", concerning which he has left a treatise in manuscript.<sup>69</sup> But despite all the treatises that had been written and remedies that had been tried against the plague since 1348,<sup>70</sup> Giovanni Francesco Olmo in his work *On Occult Properties in Medicine*, published in 1597, could still state that no cure for the plague was known, that its causes were hidden, that it was worse than all other poisons put together, and that, if you were stricken with it, all your friends would abandon you.<sup>71</sup> Here was a case where necessity was not the mother of invention, for surely nothing was more needed for four centuries than some remedy for the fell disease. When it raged at Venice in 1576 Galeatius Cairus, a physician from Pistoia, urged the establishment of a school especially to study it and an academy to discuss it.<sup>72</sup> Even intellectuals continued to die of it in the seventeenth century, when Trecaltius the elder, professor of theology at Leyden, died of it in 1602 and was followed within two months by his successor, Francis Junius.<sup>73</sup> Jacobus Zabarella, professor of botany at Padua, died of the plague in 1630, and in 1637 passed away Daniel Sennert, professor of medicine at Wittenberg, iatro-chemist, and founder of the corpuscular theory.<sup>74</sup> The latter,

<sup>68</sup> *Pius II.*, ep. CCXLVI.: "Crebri casus qui acciderunt domi B. vestrae cogunt fideles servos ad salutem domini esse sollicitos. Olim decessit peste insignis vir cognatus suus [tuus?], nuper medicus, . . . Ioannes Condalmatio et inferioris famulus . . . complures."

<sup>69</sup> "Balle Odorifere Contro la Peste", in MS. S. Michael de Muriano, Venetiis, 942, together with Aphorisms of Leonardus Floravanti. Such use of strong scents and perfumes might serve to keep off the fleas who carried the infection.

<sup>70</sup> For the medical literature evoked by the Black Death and subsequent plague tractates see the publications of Karl Sudhoff, Mrs. Dorothea W. Singer, A. C. Klebs, Stephen D'Irsay, E. Wickersheimer, and others. The "Pestschriften aus den ersten 150 Jahren nach der Epidemie des 'Schwarzen Todes', 1348", which Sudhoff has long been publishing, are completed with elaborate indexes in the *Archiv für Geschichte der Medizin*, XVII. (1925) 241-291.

<sup>71</sup> Ulmus, *De Occultis in Re Medica Proprietatibus* (1597), III. 8.

<sup>72</sup> In Latin MS., S. Marco XIV., 35.

<sup>73</sup> W. S. M. Knight, *The Life and Works of Hugo Grotius* (1925), p. 55.

<sup>74</sup> E. Gerland, *Geschichte der Physik* (1913), pp. 467-468.

however, had attained the age of sixty-five, and the Jesuit Fontana, who claimed to have discovered the telescope in 1608, died of the plague at Naples when seventy-six in 1656.<sup>75</sup> Or the pest touched scholars through their families. For instance, both parents of the encyclopaedist Zwinger, author of the vast *Theatrum Humanae Vitae*,<sup>76</sup> were afflicted by it. His father, who died of the plague in 1544, had refused to take to his bed lest he alarm his wife who already was stricken by it.<sup>77</sup>

A more general view of the presence of the plague in Germany than any of the accounts we have thus far noticed is provided for the first half of the sixteenth century by the history of the Roman Catholic, Surius, published in 1568.<sup>78</sup> Under the year 1502 he states that a most cruel pest depopulated all Germany far and wide. Under the next year he refers back to this pest as having killed in some parts one-third, in others one-half of the population, and adds that it was now followed by a horrible epidemic of divers diseases which swept away many thousands of lives. "There were in men pestiferous fevers, intestinal heats, hardly endurable headaches, fearful foulness of the breath; in fine, this year seemed to have brought nothing but slaughter and calamities." In 1508 he notes that a very wet summer afflicted the pigs and cattle with pestilence in not a few places. In 1528 he mentions the pest that devastated the French army then attacking Naples. In 1529 the English Sweat (*Sudor Anglicus*), a disease known by that name since its appearance in England in 1486 during the reign of Henry VII., killed many thousands in Germany within the space of twenty-four hours. In 1556 the pest raged in many places, especially along the Rhine and at Strasbourg, and John Sleidan, the noted Protestant historian, died of it. At the famous siege of Ostend in 1602 more perished from it than from the sword, and in 1639 four thousand men died of it in two days in the camp of Bernhard of Weimar who probably fell a victim to it himself rather than to poison.<sup>79</sup>

For the many outbreaks of the plague in England the reader may be referred to Creighton's *History of Epidemics in Britain*<sup>80</sup> or his briefer summaries in Traill's *Social England*.<sup>81</sup> The following

<sup>75</sup> *Ibid.*, p. 360.

<sup>76</sup> It was edited by his son and published at Basel, 1604.

<sup>77</sup> *Theatrum Humanae Vitae*, p. 3695.

<sup>78</sup> Laurentius Surius, *Commentarius Brevis Rerum in Orbe Gestarum ab Anno 1500*.

<sup>79</sup> W. S. M. Knight, *op. cit.*, pp. 62, 241.

<sup>80</sup> Published in 2 vols. in 1891-1894.

<sup>81</sup> See also Walter G. Bell, *The Great Plague in London in 1665* (1924),

is a typical sentence: "Twice in the Elizabethan period [in 1563 and 1593] the capital lost from a sixth to a fifth part of its population by a great plague, and in each of several other years of the reign its mortality by ordinary causes was more than doubled by plague."<sup>82</sup> A very valuable recent Italian study is Guido Guerrini's "Notizie Storiche e Statistiche sulla Peste", in the *Rivista di Storia delle Scienze Mediche e Naturali*, volume XVI. (1925), pages 293-316, with interesting statistics and bibliography for the sixteenth and seventeenth centuries especially.

Even when not actually present, the plague could hardly fail to be frequently in men's minds. Its psychological effect is well illustrated by the case of Jacques de Banne. From 1618 on he was a canon of Viviers in southern France, but is more important for us as a local historian. Of his ecclesiastical histories only fragments have been published, and the manuscripts of them have disappeared, at least for the time being. But in 1917 Auguste Le Sourd published his *Mémoires*,<sup>83</sup> which are in the form of artless notes covering the period from 1567 to 1637. Rather prone, in accordance with the well-established usage of many ancient and medieval historians, to record omens and portents, de Banne describes such occurrences as the haired comet of 1618 and the rain of black worms in 1622. But the pest, says Courteault, is the *Leitmotiv* of his work. He ascribes the local invasion of it to Huguenots who secretly brought a bedevilled unguent into Lyons and smeared the door-knockers of the houses and the holy water basins of the churches with it. Viviers was spared on that occasion, but de Banne is haunted by fear of the plague, and gives most circumstantial details concerning its progress and a collection of remedies against it. These include those of an Italian, of the King of Spain, and one that had been brought back from Jerusalem. He also recommends the employment of religious processions and prayers to the saints and the Virgin.

The effect of the pest alike upon learned science and popular superstition may be illustrated from the works of Robert Boyle in the latter half of the seventeenth century. The author of *The Sceptical Chymist* was inclined to ascribe the origin of the plague to "subterranean steams and noxious expirations of the terrestrial globe".<sup>84</sup> In a letter to Boyle from J. Beale of October 12, 1670, we read: "Whilst a person, whom for many years I have known to

<sup>82</sup> *Social England*, III. 559.

<sup>83</sup> In the *Revue du Vivarais*, pp. xv, 94. I have not had access to this periodical, but follow the review of Le Sourd's publication by Henri Courteault in the *Bibliothèque de l'École de Chartes*, LXXVIII. (1917) 359-361.

<sup>84</sup> In the 1772 edition of his *Works*, V. 58.

be creditable, was reading to me the fifth page of your *Cosmical Suspicions*, he stopped at the first period, which mentions pestilential steams", and told Beale, "' That he knew a good old woman, aged near eighty, now deceased, who said often, in his hearing, that she could know if the plague were within thirty miles of her, by a pain she had in three plague sores, which sores she had in her younger days, before she was married.' He forgot to ask, and could not now guess, what her particular aim was in mentioning thirty miles distance." <sup>85</sup> Boyle himself had also put the query, whether plagues are natural events or supernaturally inflicted by God to punish man, and thought that they might sometimes be supernatural. <sup>86</sup>

The impression made by the plague upon men's minds is also illustrated by the art of the time. Poussin's masterpiece was the painting called *La Peste*, for which he received no less than 9700 francs (in the purchasing power of 1913) from the Duc de Richelieu. <sup>87</sup>

The common occurrence of death in such a sudden, swift, and unavoidable manner, and on so vast a scale, is apt to encourage a fatalistic attitude. Perhaps the mental effect of repeated pestilences had something to do with the wide spread in the sixteenth and seventeenth centuries of the doctrine of predestination. At least we may believe that the Psalm-singing Calvinists intoned with fervor verses which for them had a grim reality that they no longer possess, verses concerning " the noisome pestilence ", or " the pestilence that walketh in darkness and the destruction that wasteth at noon-day ". Under the circumstances of those times it might indeed be a comfort to feel oneself one of God's elect, and such Puritanical names as Preserved might be more than figurative. " A thousand shall fall at thy side, and ten thousand at thy right hand ; but it shall not come nigh thee. Only with thine eyes shalt thou behold and see the reward of the wicked. Because thou hast made the Lord, which is my refuge, even the Most High, thy habitation ; there shall no evil befall thee, neither shall any plague come nigh thy dwelling." Religious persecution was not the only external evil that gave to Calvinism its stern austerity. Even a Dryden wrote :

" The living few, and frequent funerals then  
Proclaim'd Thy wrath on this forsaken place."

But it was an Arminius who voluntarily served as plague-preacher in stricken Leyden. <sup>88</sup>

<sup>85</sup> *Ibid.*, VI. 429.

<sup>86</sup> *Ibid.*, V. 56.

<sup>87</sup> D'Avenel, *Les Revenus d'un Intellectuel* (1922), p. 234.

<sup>88</sup> W. S. M. Knight, *op. cit.*, p. 56.



The scattered evidence as to the importance of pestilence as a factor in early modern history which has been here presented is meant merely to be suggestive. It might be amplified from numerous other sources and multiplied manifold. For the most part it has been gathered indirectly and happened upon incidentally to the pursuit of other investigation. Where it has been taken from other books, their authors for the most part were not particularly or primarily interested in the pest, but noted it because it was inevitably forced upon their attention. A writer on the plague in England has compared it to a shears of Fate which kept trimmed the ragged edges of the population and of great cities, relieving society to a certain extent of the burden imposed by poverty, crime, and social degradation.<sup>89</sup> But this interpretation of it as cruelly performing a nevertheless wholesome function seems unduly optimistic. Did it not also breed poverty and social degradation, and perpetuate them? But whatever its character in London, our evidence suggests that for western Europe in general it was a very wholesale affliction. The loss of life everywhere was too great to be called a mere fringe of society; it must have eaten into the vigor of the community as a whole. While the educated and upper classes had a better chance of escaping it than those who suffered from malnutrition or lived in crowded and unsanitary quarters, we have seen that they often failed to escape it, and that even if they did, their life was apt to be much upset by it. It was, then, no mere shears of Fate but a blight upon early modern civilization.

LYNN THORNDIKE.

<sup>89</sup> C. Creighton in Traill's *Social England*, III. 145.



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# THE SURVIVAL OF MEDIAEVAL INTELLECTUAL INTERESTS INTO EARLY MODERN TIMES

By LYNN THORNDIKE

THOSE external conditions of life which we call mediaeval largely persisted into early modern times or even until the French Revolution or the nineteenth century. In most parts of Europe the life of the peasant and the land system were little altered. In most towns the picturesque walls and towers, streets and houses, remained essentially unchanged, except that with the falling-off in population whole quarters might be deserted, or with the decline in taste charming Gothic arches, windows, columns, and ornamentation might be walled up, plastered over, cut through, or otherwise concealed and disfigured. To a large extent, save in royal capitals and new commercial centres, the old buildings were made to suffice. Thus, if a new school were opened, instead of occupying a new building, it would move into some half-ruined monastery or abandoned hospital. The feudal castles were battered down and dismantled only in the seventeenth century. If knighthood was not still in flower in the sixteenth century, nevertheless a captain of that time could say that a good cavalier on a good horse was as superior a being as there could be in this world.<sup>1</sup> The gild system was essentially the same in the seventeenth century as in the thirteenth,<sup>2</sup> and did not disappear on the continent of Europe until the French Revolution and the middle of the nineteenth century. Quaint old custom and procedure, popular festivals and liberties, had been reduced; artisans worked longer and were paid less;<sup>3</sup> in the gilds there was less charity<sup>4</sup>

<sup>1</sup> G. d'Avenel, *Les revenus d'un intellectuel de 1200 à 1913* (Paris: Flammarion, 1922), p. 274.

<sup>2</sup> Indeed, Espinas would put the period of its height in the fourteenth and fifteenth rather than the thirteenth century.

<sup>3</sup> E. Martin-Saint-Léon, *Histoire des corporations de métiers des origines jusqu'à 1791* 3rd. ed. (Paris: Alcan, 1922), pp. 501-502. It was especially from 1300 to 1550 that the condition and pay of artisans grew worse. In the seventeenth century they had a longer working day than in the thirteenth century, and their pay had not yet risen to correspond.

<sup>4</sup> On the general decline of charity in the sixteenth century see Lucien Romier, *Le royaume de Catherine de Médicis* (Paris: Perrin, 1922), II, 75. Various local histories might be adduced to the same effect.

and unity. Nor had the lot of the teacher and writer improved. But all this was in the nature of subtraction rather than alteration and innovation.

The point I wish to make is this: if the external conditions were still so largely mediaeval, why should thought change? If man is largely dependent for his ideas upon his environment, such new thought as there was in the early modern period will be found to be based upon, or connected with, new or newly discovered things: manuscripts of Greek tragedies and comedies, and of the essays of Plutarch and Lucian, new continents across the Atlantic, new scientific instruments like the telescope and microscope which opened up vast realms of nature to discovery. Otherwise the old thought and methods of thought might be expected to go on as before.

Much has been written, it is true, concerning the new spirit of the Renaissance and of the Reformation. But gradually it is becoming recognized that both the humanists and the reformers were singularly lacking in originality. As the seventeenth century opened, Hugo Grotius was the precocious pet of the humanistic circles in which moved Scaliger, Casaubon, and Heinsius. The first text he edited was that most early-mediaeval of all early-mediaeval works, the *De nuptiis philologiae et mercurii* of Martianus Capella; his first original poem was on a theme which had been repeatedly treated in the mediaeval religious drama.<sup>1</sup> Nevertheless it may be admitted that in the early modern centuries there was a certain turning away from mediaeval tradition. The humanist, philologist, or antiquarian became enamoured instead of the classical tradition; the reformer turned away in disdain from the traditions of the mediaeval church. Perhaps with most zest of all, absolute monarchs like Francis I cast aside the ancient laws of the realm and the solemn promises of their predecessors, riding roughshod over past privileges, franchises, and institutions, whether Estates, Parlement, or University. This break with the immediate past was undoubtedly important. But, except that it also seriously affected the fine arts, it was in the main limited to such fields as have already been mentioned.

<sup>1</sup> Wm. S. M. Knight, *The Life and Works of Hugo Grotius*, London: Sweet and Maxwell, 1925.

In other fields the course of development already initiated in the mediaeval centuries went on uninterrupted. There was no sufficient occasion, for instance, for a physician or a lawyer or a mathematician or a chemist or an optician or a clock-maker or a cartographer or a munition-manufacturer to reject the mediaeval foundations that had been laid for him. "It was a continuation of a mediaeval tradition," says Rashdall, "that made Montpellier and Padua the centres of European medicine in the sixteenth and seventeenth centuries."<sup>1</sup> And "there were surgical writers at Bologna as early as the second half of the thirteenth century whose works continued in sufficient circulation to be included among the earliest productions of the Venetian press and to be often reprinted up to the middle of the seventeenth century."<sup>2</sup> "In political theory," Dr. Figgis states, "many of the mediaeval arguments and methods subsisted until the eighteenth century."<sup>3</sup>

The divisions of the field of knowledge, the classification of the different subjects studied, the main interests of the human mind, remained almost the same in early modern times as they had been in the thirteenth century. The humanism of the intervening centuries had added classical philology and antiquities, a more direct and ampler acquaintance with Greek; the new temper of the times and warring sects had added controversies — that was about all. The courses offered in universities, the titles of academic chairs, the subject headings employed in catalogues of libraries — all these remained but little altered. Lives of the saints and commentaries on the Sentences, liturgical works and ascetic treatises were generally abandoned by Protestants, but were still read and written by Catholics. With the secularization of the Reformation period more space in the academic curriculum was given to history and politics, but we must remember that mediaeval historiography had been abundant and that Aristotle's *Politics* and *Economics* had even been translated into French in the fourteenth century.

<sup>1</sup> Hastings Rashdall, *The Universities of Europe in the Middle Ages* (Oxford, 1895), I, 266.

<sup>2</sup> *Ibid.*, I, 245.

<sup>3</sup> John Neville Figgis, *From Gerson to Grotius, 1414-1625* (Cambridge: University Press, 1916), p. 26.

Our main thesis may be excellently illustrated by the case of Descartes, the philosopher who is commonly represented as having made such a sharp break with mediaeval scholasticism. Yet even his celebrated "*Cogito, ergo sum*," merely repeats one of the four states of certitude of Duns Scotus, the schoolman of the early fourteenth century. Descartes was opposed to over-much study and scorned the teachings of the schools. He would begin with a preliminary attitude of sweeping doubt as to all previous traditions and accepted knowledge, and then, by "the easy path" of the natural reason possessed by almost every man, "find in himself, and without borrowing from any, the whole knowledge which is essential to him in the direction of his life, and then by his study succeed in acquiring the most curious forms of knowledge that the human reason is capable of possessing."<sup>1</sup>

Yet we find Descartes concerned with many of the problems, topics, and notions which had occupied the attention of the science and philosophy of previous centuries. He employs such familiar captions of mediaeval physics as Meteorology and Dioptrics. He asks such an old type of question as, Why children and old people weep more easily than others. He repeats the old notion of the formation of animal spirits in the cavities of the brain. Indeed, it was not overthrown until the time of Gall in the nineteenth century. Descartes' doctrine of the pineal gland in the brain as the connecting link between soul and body reminds one of the explanation of thought as the opening and closing of "a particle of the substance of the brain similar to a worm," which we find in the ninth century Arabic treatise of Costa ben Luca, *On the Difference between Soul and Spirit*.<sup>2</sup> Costa ben Luca represented this particle as forming a sort of valve between the anterior and posterior ventricles, and held that when a man was in the act of recalling something to mind, this valve opened and the subtle spirits passed from the anterior to the pos-

<sup>1</sup> *The Philosophical Works of Descartes*, rendered into English by Elizabeth S. Haldane and G. R. T. Ross (Cambridge: University Press, 1911), I, 305, from *The Search after Truth by the Light of Nature*.

<sup>2</sup> *Liber de differentia spiritus et animae*: for editions, manuscripts, and some further account of the treatise see my *History of Magic and Experimental Science* (New York: Macmillan, 1923), I, 657-659.

terior cavity. Now hear Descartes' explanation: "Thus when the soul desires to recollect something, this desire causes the gland, by inclining successively to different sides, to thrust the spirits towards different parts of the brain until they come across that part where the traces left there by the object which we wish to recollect are found. . . ." <sup>1</sup>

The magnet and the rainbow played about as large a part in Descartes' philosophy as in mediaeval science. To the time-honored problem, Why is the sea not increased by the rivers flowing into it? he gives, not the modern answer, evaporation, but the answer which Ristoro d'Arezzo in the thirteenth century and others <sup>2</sup> since had given, Because the surplus water returns by underground passages to the tops of the mountains. Descartes still had faith in Aristotelian first causes, criticizing Galileo for merely investigating particular phenomena and forces and so building without a foundation. So we might go on to show how Descartes denied the existence of a vacuum, discussed such oft-discussed matters as quicksilver, sulphur, and bitumen, nitre and salts, how stones and minerals are produced by vapors ascending from the interior of the earth, how vermilion or *minium* is made — a stock paragraph in mediaeval chemical treatises and collections of recipes for painters, why the flame of the candle is pointed.

Descartes of course often offered a new explanation, but the fact remains that he was trying to answer the same old set of questions and observing the traditional classification of the arts and sciences. He was still as interested as the thirteenth century had been in the marvelous secrets of nature. Although in one place he states that it will be impossible for him to treat in detail of such matters as the phoenix,<sup>3</sup> he soon expresses a curiosity concerning even "apparitions, illusions, and in a word all the wonderful effects attributed to magic," and promises to gratify it. "Then I shall place before your eyes the works of man upon corporeal objects, and after having struck wonder into you by the sight of machines the most powerful,

<sup>1</sup> *The Philosophical Works of Descartes*, 1911, I, 350, from *The Passions of the Soul*.

<sup>2</sup> See pp. 198-199 of my paper, "The *De Constitutione Mundi* of John Michael Albert of Carrara," *The Romanic Review*, XVII (1926), pp. 193 ff.

<sup>3</sup> *Philosophical Works*, 1911, I, 309, from *The Search after Truth*, *cit. supra*.

and automata the most rare, visions the most specious, and tricks the most subtle that artifice can invent, I shall reveal to you secrets which are so simple that you will henceforward wonder at nothing in the works of our hands.”<sup>1</sup> These words sound almost like a literal translation of some sentence from the treatise ascribed to Roger Bacon “On the Secret Works of Art and Nature and the Nullity of Magic.” Descartes was not without faith in such time-worn marvels and ancient superstitions as the inexhaustible lamps supposed to burn for centuries without addition of new fuel, or the bleeding of the wounds of a corpse at the approach of the murderer.<sup>2</sup> He was confident that his Method could offer satisfactory explanation of the truth of such marvels.

Finally, before taking leave of Descartes, let us recall that even his claim to be the inventor of analytical geometry must be discounted, since Nicholas Oresme had already made use of coördinates in the fourteenth century.<sup>3</sup> Oresme had also employed fractional exponents for powers,<sup>4</sup> an innovation formerly attributed to the sixteenth-century mathematicians, Vieta and Stevin.

These cases illustrate the truth that not only were many intellectual interests of the middle ages perpetuated in the early modern centuries, but that what have been acclaimed as new discoveries resulting from the free spirit of the Renaissance and the Reformation were often mere revivals of, or improvements upon, ideas which had already been broached in the thirteenth or fourteenth century. Duhem has traced the use made by Leonardo da Vinci in his scientific thought of the previous mediaeval literature, and shown that his geological ideas, for example, were largely taken from Albertus Magnus in the thirteenth, and Albert of Saxony in the fourteenth century.<sup>5</sup> Cardan was influenced in his turn by da Vinci, while Palissy plagiarized from Cardan. Torricelli, Galileo’s private secre-

<sup>1</sup> *Philosophical Works*, 1911, I, 311.

<sup>2</sup> *Principles*, IV, 187: in C. Adam and P. Tannery, *Œuvres de Descartes*, 12 vols., Paris: Cerf., 1897-1910.

<sup>3</sup> In the *Tractatus latitudinum formarum*, printed Padua, 1486; Venice, 1505; or the *Tractatus de figuracione potentiarum et mensurarum difformitatum*.

<sup>4</sup> In the *Algorismus proportionum*, ed. Maximilian Curtze, Berlin, 1868, whose *Mathematische Schriften des Nicole Oresme*, Berlin, 1870, may also be consulted.

<sup>5</sup> Pierre Duhem, *Études sur Léonard de Vinci; ceux qu’il a lus et ceux qui l’ont lu*, Paris, 1906, 1909, 1913, 3 vols.



tary and demonstrator by his famous experiment of the possibility of a vacuum, in his dynamics often used the reasoning and even the very wording of Jean Buridan, the Parisian schoolman of the fourteenth century.<sup>1</sup> Gesner and Cardan made large use of Albertus Magnus. The thirteenth-century work of Bartholomew of England *On the Properties of Things*,<sup>2</sup> intended by its author only as a handy compilation, was the chief source of scientific information for writers of the Elizabethan age. Mary P. Ramsay has pointed out the mediaeval doctrines in the English poet, Donne, of the seventeenth century.<sup>3</sup> Knight has shown that Grotius' work *On the Law of War and Peace* covered ground already repeatedly trod by the schoolmen.<sup>4</sup> Anatomy and physiology did not begin with Vesalius and Harvey. Guy de Chauliac in the fourteenth century, and the earlier writers whom he cites, possessed anatomical knowledge which has been commonly ascribed to a later period.

Nor did the men of the later centuries always fail to recognize the greatness of their predecessors. Gabriel Naudé in the seventeenth century notes that Scaliger and Cardan in the sixteenth put Richard Suiseth or Swineshead, the "Calculator," of the fourteenth century, in the rank of the ten rarest wits that the world had ever known.<sup>5</sup> Regiomontanus has usually been represented, perhaps especially by German historians, as having resuscitated mathematics from the gloom and neglect of the middle ages. He was better appreciated by Cardan who did not regard him as much of an originator, asserting that he had taken his *Tabulae directionum* in large part from Johannes de Blanchinis of the fourteenth century, his *Epitome* from a still earlier mediaeval writer of Milan, and his treatise on Spherical Triangles from a Hebrew of Spain.<sup>6</sup>

<sup>1</sup> Duhem, *op. cit.*, III, vii.    <sup>2</sup> See Ch. 54 of my *History of Magic and Experimental Science*.

<sup>3</sup> *Les doctrines médiévales chez Donne, le poète métaphysicien de l'Angleterre, 1573-1631*, 2me éd. (London: Oxford University Press, 1924).

<sup>4</sup> Wm. S. M. Knight, *The Life and Works of Hugo Grotius* (London: Sweet and Maxwell, 1925), chapter on the *De iure belli et pacis*.

<sup>5</sup> G. Naudé, *Instructions concerning the erecting of a library, interpreted by Jo. Evelyn* (London, 1661), p. 51. This translation was reprinted by Houghton, Mifflin & Co., Boston, in 1903.

<sup>6</sup> P. Gassendi, *Tychonis Brahei equitis Dani astronomorum coryphaei vita. Accessit Nicolai Copernici, Georgii Peurbachii et Joannis Regiomontani astronomorum celebrium vita* (Paris, 1654), p. 363.

The mediaeval regard for such ancient authorities as Aristotle, Galen, and Ptolemy was not diminished by the classical Renaissance and Protestant Reformation. Sometimes the sixteenth century seems guilty of a blinder adhesion to the letter of such authorities than had previously been the case. Duhem held that the archaic Italian Renaissance brought into honor again doctrines of Aristotle and Averroës which had been abandoned about 1300.<sup>1</sup> John Dryander, in his 1540 edition of the Italian anatomist, Mundinus, of the early fourteenth century, was shocked to find that his author did not always follow Aristotle and Galen (as if they had always been in agreement among themselves!) and he presumed to correct Mundinus by citing Galen.<sup>2</sup> When Francis I in 1544 by royal edict condemned both of the recent works of Ramus against Aristotle and forbade him henceforth to attack Aristotle or other approved authors, his sympathizers held that this was an unprecedented assault upon academic freedom, and that it had hitherto been no crime to oppose Aristotle.<sup>3</sup> Henceforth, however, it was to be, at least in Paris, where as late as 1642 the Sorbonne and Parlement censured certain men for attacking the Aristotelian doctrine of form, matter, and substantial forms.<sup>4</sup> Luther for a time indulged in violent vituperation of Aristotle,<sup>5</sup> but he was much irritated when Carlstadt and Melancthon took his invective literally instead of in a Pickwickian sense.<sup>6</sup> By 1535 Melancthon had seen the light and was convinced that without Aristotle "pure philosophy cannot be retained or indeed any right system of teaching or learning," and that "Aristotle wrote so eruditely of civil customs that nothing more is needed."<sup>7</sup> For a long time thereafter the Aristotelian logic, physics,

<sup>1</sup> Duhem, *Études sur Léonard de Vinci* III, v.

<sup>2</sup> At fols. 445 and 675. Dr George Sarton suggests that Niccolò Falcucci (died 1411) may have been the first author to proclaim Galen's anatomical infallibility.

<sup>3</sup> Audomar Talaes, quoted in *Joannis Launoii de varia Aristotelis in academia parisiensi fortuna liber* (Paris, 1662), pp. 255-256.

<sup>4</sup> J. de Launoy, *De varia Aristotelis in academia parisiensi fortuna*, 1662, p. 310.

<sup>5</sup> Io. Heremannus ab Elswich, *De varia Aristotelis in scholis Protestantium fortuna scheldiasma*, 1720, pp. 20-25.

<sup>6</sup> Laurentius Surius, *Commentarius brevis rerum in orbe gestarum 1500-1568*, 1568, p. 150.

<sup>7</sup> Elswich (1720), pp. 36, 38. On the general question of the Protestant attitude to Aristotle see further Gius. Saïtta, *La scolastica del secolo XVI e la politica dei gesuiti* (Turin: Bocca, 1911), pp. 41-50.

and philosophy remained as firmly intrenched in most Protestant as in Catholic schools. Even so critical a spirit as Pierre Bayle, when he became professor of philosophy at Sedan in 1676, continued to follow Aristotle in logic and morals, though introducing the Cartesian physics, while his metaphysics remained scholastic with some attention to Cartesianism.<sup>1</sup>

The good old mediaeval teaching of dialectic received severe punishment at the hands of Renaissance critics and satirists, but appears to have taken it all and come back smiling. When the Collège de Guienne was instituted in 1533 at Bordeaux, it was regarded as a progressive, humanistic enterprise, and Tartas, its first principal, was represented as going south to revive learning, accompanied by twenty-one teachers of Hebrew, Latin, and Greek. As a matter of fact, only one or two of them knew any Greek, while Hebrew was never taught at the school. However, disputations were abandoned, and the emphasis was on the Latin classics. Nevertheless, dialectic was taught from the start, and although Nicholas de Grouchy at first dictated his lectures in Greek, he concluded by using the Latin Aristotle of Joachim Périon. The pupils were dissatisfied with his successor in the chair of dialectic, and we find efforts being made to secure someone qualified to comment on Aristotle in Latin. This might sound as if good teachers of logic were becoming scarce, but at the beginning of the next century, when the study of Greek had been dropped from the curriculum, we find that the principal of the school was a Scot named Balfour whose most important work, published in 1616, was a commentary on the *Organon* of Aristotle.<sup>2</sup>

Similarly in the field of medicine there was at first a marked tendency in the late fifteenth and first half of the sixteenth century to revert to the Greek text of Hippocrates and Galen, and to cast aside the great Arabic medical writers of the intervening period. This movement, however, never went very far, and was soon seen to be an antiquarian retrogression rather than modern progress. The normal trend of early modern medicine was rather to continue, with

<sup>1</sup> J. Delvolvé, *Essai sur Pierre Bayle* (Paris, 1906), p. 29 et seq.  
Ernest Gaullieur, *Histoire du Collège de Guyenne*, Paris, 1874.

occasional innovations such as those of Paracelsus, the methods and matter of the numerous mediaeval works and Latin translations. Since the later mediaeval centuries had seen no little progress in anatomy, medicine, and surgery, this situation cannot be called one of mediaeval stagnation, although it perhaps became stagnation in the subsequent centuries. Be that as it may, we find the candidates for degrees or professorial appointment at Montpellier in 1574 defending theses which can generally be duplicated in the works of the Jewish physician Isaac of the tenth century or of Petrus Hispanus and Pietro d'Abano in the thirteenth.<sup>1</sup> These questions were argued theoretically or scholastically from the usual premises of ancient and mediaeval science and their *Weltanschauung*. This may be further illustrated by quoting the forms followed by candidates for the doctorate at Padua in 1642 and 1665 A.D., as preserved in two manuscripts of the Sloane collection of the British Museum.

Relying on the inspiration of the divine spirit and your good will, O most wise fathers, I enter on explanation of the points assigned me by lot by the most illustrious presiding officer for today's examination, in expounding which I follow the received order in this dear university and proffer four things. First, I will show the connection of the text with what went before. Second, I'll expose the author's meaning. Third, I'll divide the text into parts. Fourth, I'll explain the various parts and, if any matters

<sup>1</sup> *Cartulaire de l'Université de Montpellier*, ed. A. Germain, vol. II, 1912. See the Theses of François Sanchez of 2-4 August, 1574, with notes of the argument jotted down by the examiner, and the Theses of Jean Blazin of 7-9 October, 1574. Among the questions discussed are:

- Which meal should be the more frugal, dinner or supper?
- Is man of hotter constitution than woman?
- Is the vital faculty different from the animal?
- Is respiration necessary to all animals?
- Is wine or water more healthful?
- Is purging or bleeding more suited to children?
- Is vomiting or purging the better treatment for dysentery?
- Should bread be eaten with garden fruits?
- Is the flesh of poisonous animals poisonous to eat?
- Is a wound from contusion properly cured by agglutinating remedies?
- Are purging and bleeding good for virulent stings and bites?
- Is suppuration caused by unnatural heat?
- Do heavy and foetid odors help those who are suffocating?

These may be compared with questions from Petrus Hispanus and Peter of Abano, given in my *History of Magic and Experimental Science*, II, 504-505, 886-87.

are worthy of consideration, I'll note them too. I have to interpret a two-fold point, one philosophical, the other medical. The philosophical is from the second book of Aristotle's *Physics*, and its opening words are: "Quasi natura sit principium . . ." The medical is from the *Ars Parva* of Galen, chapter 43, opening, "Humidius autem et frigidus. . ."

I come then to the first part of the text, in which Aristotle thus defines nature, that it is the principle and cause of motion and of that rest in which it is first and *per se* and not *secundum accidens*. Moreover, that nature is the principle of motion and rest may be confirmed by this argument: whatever gives the essence to things, gives likewise the operations following the essence. But nature gives things their essence, ergo etc. The major (premise) is clear; for whatever immediately constitutes a cause, the same also immediately constitutes the effect. The minor (premise) is proved by this reasoning. If nature is both the matter of natural things and their form, it also gives them their essence. But the former is true, and hence the latter also. A second argument that I adduce is that whatever is the principle and cause of increase and alteration and progression, the same is the principle of motion and rest. But nature etc., ergo etc. . . .

In another case the candidate is assigned the problem of a youth of hot and dry temperament laboring with intermittent fever complicated by headache. His diagnosis is that the patient has a hot and dry distemper of the heart and entire body, caused by bilious humour putrefying outside the veins in two places. The headache comes from bilious and putrid vapor affecting the brain. Hence the patient requires cold and wet treatment, riddance of the putridity and inhibition of further putrifying by means of attenuating, abstergent, incident, and imminent remedies, with cordials and liver-pills. Hippocrates is cited to the effect that the disease is not perilous and that a cure may be hoped for. The candidate for the doctorate advises bleeding from the basilic vein of the right arm as much as the patient's constitution will permit.<sup>1</sup>

It should not be thought, however, that the observance of such forms was necessarily incompatible with observation and experiment. The very man who in 1583 had an anatomical theater con-

<sup>1</sup> In the foregoing paragraphs I have followed the Latin text in Sloane MS. 727, fols. 47r-48r, and fol. 50r-v, *Forma recitandorum punctorum et casuum in gymnasio Patavino*, 1642 A.D. Essentially the same is Sloane 2880, fols. 97-115v, *Methodus resolvendorum casuum pro doctoratu in gym. Patav.*, 1665 A.D. Similar MSS occur in other collections.

structed at Padua, at the same time renewed the practice of disputations which had begun to flag.<sup>1</sup>

In Roman Catholic lands scholastic theology also, which has often been represented as moribund in the fourteenth century, continued to hold its own into the eighteenth. The University of Salamanca was the great centre of Thomism in the sixteenth century. There is a tradition that Duns Scotus was buried alive. Certainly his soul went marching on in many a subsequent disputation and tome. And as his corpse was repeatedly exhumed — in 1476, 1509, 1619, 1642, and 1706<sup>2</sup> — so his philosophy was repeatedly revived. One such occasion was in the seventeenth century when the teaching of two young scholars from southern Italy spread like wildfire through all the Scotist schools.<sup>3</sup> The professors of the University of Rome from 1580 to 1690 were active in publishing works on the philosophy and theology of Aquinas,<sup>4</sup> while Scotism found defenders still in the eighteenth century.

Let us turn very briefly to yet other sides of education. In the schools of Champagne in the second half of the sixteenth century reckoning was still taught by the means of jetons or counters in the mediaeval manner.<sup>5</sup> The old mediaeval textbooks also continued long in use. That meagre epitome of astronomy, the *Sphere* of Sacrobosco, written in 1244, was still taught at the University of Montpellier in 1608. The logic of Paul of Venice, who had a great reputation as an astronomer and philosopher in the early fifteenth century but seems to have done little more than reproduce earlier mediaeval authors, found, according to Momigliano, a last refuge in the schools of the Jesuits in the sixteenth and seventeenth cen-

<sup>1</sup> See in a Venetian MS., S. Marco Ms. Lat. Classis I, cod. 106, in the dedication of Antonius Riccoboni's *In Epist. Pauli ad Rom.* to Laurentius Massa the following passage quoted by Valentinelli, *Bibliotheca Manuscripta ad S. Marci Venetiarum*, 1868, I, 254: "qui cum rei litterariae triumviris esset a secretis, ad res invisendas, post vacationes autumnales anni 1583 Patavium missus, de anatomico theatro construendo egit; idemque encyclicas disputationes, quae frigere coeperant, disputandi tempore atque ordine constituto, rursus excitavit ratasque fecit."

<sup>2</sup> See the long article on Scotus in the *Histoire Littéraire de la France*, XXV, 409 et seq.

<sup>3</sup> Ant. Mongitore, *Bibliotheca Sicula* (Palermo, 1708-1714), I, 112-113.

<sup>4</sup> Gius. Caraffa, *De gymnasio romano* (Rome, 1751), pp. 464-477.

<sup>5</sup> M. Poinsignon, *Histoire générale de la Champagne et de la Brie*, 2d ed., Châlons, 1896-1898, 3 vols.

turies.<sup>1</sup> Boethius was the text in music at Oxford in the eighteenth century. The brief compendium of the philosophy of Albertus Magnus entitled *Philosophia pauperum* was being used at the University of Cracow in 1777.

Alchemy, astrology, and other occult sciences continued on much the same path as they had followed in the twelfth and thirteenth centuries, and men of note in science and thought still were not above lending a favorable ear or even pen to their claims. The works of Henry Cornelius Agrippa, Porta, and Cardan contain almost no superstition not found in previous works. A Giordano Bruno, an Achillini, a Bodin, a Kepler, a Francis Bacon, a Robert Boyle, all had their little weaknesses in these matters. Such a doctrine as that of Bodin concerning climate, instead of constituting a new modern contribution is little more than a borrowing from mediaeval astrology, whose last sighs have sometimes been mistaken for the first breath of a geographical interpretation of history.

Finally, let us note that, despite the absorption of the humanists in classical history and antiquities, there was much historical interest in the mediaeval past manifested from the sixteenth to the eighteenth centuries. Familiar enough to us perhaps is the appeal to history made by Protestants and Catholics and reflected in such rival enterprises as the Magdeburg Centuries and the Annals of Baronius; sufficiently familiar, too, the patriotic national histories and the publication of royal records. But there were also numerous works written upon the past of individual towns and localities, of universities and learned professions. At a time when centralization and unification in a few courts and capitals took away the life and power of the old local centres, it was natural that they should seek solace in a review of their historic past. At a time when absolute monarchy or foreign domination allowed few men the active exercise of citizenship, it was not strange that much intellectual rather than political history was written. And such works almost always convey the impression of intellectual continuity between the mediaeval centuries and their own times.

<sup>1</sup> Felice Momigliano, *Paolo Veneto e le correnti del pensiero religioso e filosofico nel suo tempo* (Udine, 1907), p. 125.



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## SOME THIRTEENTH-CENTURY CLASSICS

LYNN THORNDIKE

WHEN we speak of "the Classics," we are apt to have in mind the extant works from certain periods of ancient Greek and Latin literature which, since the days of Italian humanism, have rather monopolized that designation. A Chinese, however, would think in this connection of the Confucian Canon, and a mediaevalist may perhaps be pardoned for allowing his thoughts to stray back to masterpieces of the thirteenth century. In a recent newspaper "symposium" (corpse of Bacchus, lie still and shades of the Deipnosophists, begone!) as to the twelve leading names in all literature, or at least all western literature, most of the present "best-sellers" who were consulted named Homer, Virgil, and Plato, while some even included the three Greek tragedians and Epictetus. But my fleeting glance at this consensus of expert opinion failed to detect any mention of Cicero, whom I, like Petrarch and the old grammarian of Vicenza in the fourteenth century, had always regarded as about the classiest classic of them all. When treason thus boldly rears its head in the very circle of the platitudinous, we may venture to violate the classical monopoly a little further.

Possibly we may even do some violence to the strict and proper sense of the word "classic," since we shall extend its application beyond the field of pure literature to works which were not remarkable for perfection of form or excellence of style, but were standard rather in the sense of being authoritative in their own age, representative of it, and forming the foundation for future culture for several centuries. If to-day the very authors and titles of some of these works are little known, it is partly because the humanistic reaction of the so-called Renaissance gradually introduced a narrow conception of culture which left them in outer darkness. Yet what can we know of the thirteenth century without an acquaintance with such books? How inverse and disproportionate to study the struggle of empire and papacy, or even the economic and social structure of

gild and manor, and yet almost totally ignore many of the books which were then known, if not to every school-boy, at least to most persons of general education, and which constituted the warp and woof of the thought, the mental attitude, the *Weltanschauung* of a whole period! That period was not merely a single century. These works were the especial product of one century, the thirteenth, but they continued as the favorite reading, the text-books, the authorities, the manuals, the works of reference, the handy guides of several centuries following. On to the sixteenth century their sway remained virtually unabated; some held their own well into the eighteenth century.

What works are to be selected as the classics of the thirteenth century, using that term a little broadly to include the first years of the century following? I have never seen such a selection; so far as I know, it has never before been made. So little has this method of approach been employed, so varied are the fields of interest to be covered, that it is not a little difficult for a person who is intimately acquainted with only one or two phases of mediaeval culture to pull his wits together and try to think of a fairly representative list of standard works from the thirteenth century which continued to influence deeply the centuries following. But possibly those that occur to one rather offhand while on vacation away from libraries, without searching out in particular histories of scholasticism, medicine, law, and literature, or without systematically ransacking one's own notes or drawers of bibliography, may prove as suggestive and helpful as any. I may as well admit now that I have not read all the works to be mentioned; any reader who has read them all may cast the first stone. I must also own that some of the titles to be listed were unknown to me only a very few years ago. Consequently there are very likely to be other important ones which have not merely slipped my mind for the moment, but never yet come to my attention. The list is also probably both imperfectly balanced and somewhat subjective. Nevertheless, I venture the assertion that a number of the works included will be unknown to the average reader even of this periodical, while I cherish the hope that the list may stimulate or irritate those who are better informed to suggest

additions or substitutions, or to draw up independent lists of their own.

Beginning, however, on more familiar and common ground, with the field of modern literature and writings in the vernaculars, if our choice were to be limited to two works, which may seem to many a cruel restriction, it might well fall on Dante's *Divine Comedy* and *The Romance of the Rose* by Guillaume de Lorris and Jean de Meun. We need not dispute concerning the former. The latter set a long fashion of the plot which occurs in a dream and of the allegorical romance, and is one of the most influential and most imitated works in literary history.

Our other thirteenth-century classics were almost all written in Latin and consequently are less well known. For example, what was the leading work of that century in Latin poetry or prose from the standpoint of style and pure literature? I do not know the correct answer, and doubt if there would be any general agreement, or even if this problem has been sufficiently considered. But not to leave a complete void in this respect in our list, I will feebly suggest as a starter the name of Geoffrey of Vinsauf, an Englishman who taught at Bologna about 1200. His *Art of Poetry* (*Poetria Nova*) not only is said to rank him among the best poets of the time, but also was an important work in the history of literary criticism. He also wrote in prose an *Ars dictaminis* or treatise on letter-writing. A better-known specimen of thirteenth-century treatises on this *Ars dictaminis* or *Ars dictandi*, to which mediaeval chancelries and stylists gave so much attention, would probably be, however, the *De forma dictandi* of Petrus de Vineis, a secretary to the emperor Frederick II, who flourished about 1230.

Another prominent writer associated with Frederick II, by whom he was imprisoned, was Albertanus, whose name occurs not infrequently in catalogues of collections of mediaeval manuscripts. While in prison he wrote *On the Love and Cherishing of God and One's Neighbor and Other Things, and on the Form of a Righteous Life* (*De amore et dilectione Dei et proximi et aliarum rerum, et de forma honestae vitae*), dedicated to his son, Vincent. To his third son, John, he dedicated a *Book of Consolation and Counsel* (*Liber consolationis*

*et consilii*), from which, in its Italian translation, Renaud de Louens derived his *Roman de Mélibée et Prudence*, and Chaucer in turn his *Tale of Melibeus*. It is, however, the little treatise which he dedicated to his second son, Stephen, *Of the Doctrine of Speaking and Keeping Silent* (*De doctrina dicendi et tacendi*) that I would include among our classics, since it was more often printed and translated than the other two, and, I think, occurs more often in the manuscripts. It expands, with many additional sub-points and a wealth of quotation from past authors, the familiar verse or proverb, "*Quis, quid, cui dicas, cur, quomodo, quando, requiras.*"<sup>1</sup> Although the title of Albertanus' treatise is somewhat similar to those of works on the *Ars dictandi*, its content, as may be imagined, is largely of a moralizing strain. It is certainly not a great work, but it seems to have been popular and characteristic of the age.

Turning back from this digression and from the rhetorical exercise of Latin style to the elements of grammar, we may include three very influential books in that field. First is the *Doctrinale* of Alexander of Villedieu, near Avranches in Normandy. Strictly speaking, it belongs to the twelfth century, having been written in 1199. Consisting of some 2645 leonine hexameters, it was easy to memorize, and it was strong in syntax where the earlier work of Priscian (about 500 A.D.) was weak. It was generally used in the fourteenth and fifteenth centuries, as the numerous extant manuscripts — at least two hundred and fifty — testify. Despite the criticisms of humanistic grammarians, which were not always well taken, it continued so extensively in use after the invention of printing as to run through nearly three hundred editions. It was supplemented by the more advanced *Graecismus* of Eberhard of Béthune, which was composed in 1212 and was likewise written in hexameters. The third work of the sort was the *Catholicon* of Brother John of Genoa, completed in 1286. Four of its five component books dealt with grammar and prosody; the fifth was a lexicon. It was one of the first

<sup>1</sup> "Who you yourself are, what you say, to whom you speak, Why, how, and when: these six things seek." There are other variants of it, of course. Another thirteenth-century author gives it as:

"Si sapiens fore vis, sex(?) serva que tibi mando:  
Quid dices, et ubi, de quo, cum quo, quando."

incunabula to bear an indication of the date of printing, having appeared in 1460 from the press of Faust and Schaeffer. It was also printed at Mainz in 1490, at Venice, and elsewhere.

After the mediaeval boy had finished with grammar school, he devoted several years at the university to the study of logic. Apparently the most widely employed text in the subject that appeared during the thirteenth century, and that continued longest in use thereafter, was the *Summulae Logicales* or *Parua Logicalia* of Petrus Hispanus, who crowned his scholarly career by becoming a cardinal and then Pope John XXI. He composed another handbook of about equal popularity in the field of medicine, the *Thesaurus Pauperum*, a compendium of remedies for various diseases arranged in order from the head to foot of the human body. Numerous editions attest its currency in the sixteenth century, a time when the humanists and Ramus were assailing the *Summulae Logicales*. However, the very humanist who attacked it might have a short time before written some complimentary verses for a friend's edition of it. Or another would try to soften its asperities and lighten its abstractions by reducing its principles to a game of cards. The *Thesaurus Pauperum* required no such popularization, since it already contained enough occult virtues and marvellous remedies to make a very widespread appeal.

In the realm of mathematics the arithmetic or *Liber Abaci* of Leonard of Pisa, which at the beginning of the century (1202, with revised edition in 1228) introduces us to the Hindu-Arabic numerals, did not become as widely known and generally used as it deserved to be. But the *Sphere* of Sacrobosco, or John Holywood, written in 1244, a brief presentation of the main points of the Ptolemaic astronomy, received, if anything, more attention than it deserved and was the subject of many commentaries both mediaeval and early modern. Almost equally well known was the *Theory of the Planets* by Campanus of Novara, who was the author of other astronomical treatises and the translator of Euclid. A third stand-by were the astronomical tables drawn up by order of King Alfonso the Wise of Castile. It is to be remembered that such astronomical works found a relatively much larger reading public than would

corresponding works to-day because of the universal credence then in the control of inferior creation by the movements of the stars, or astrology.

To Campanus, whom we have just mentioned, one Simon Cordo of Genoa, author of a number of medical works and translations, in 1292 dedicated his *Key to Health* (*Clavis sanationis*). Of the many medical treatises produced during the thirteenth century, aside from the already noted *Thesaurus Pauperum*, perhaps the *Synonyms* of this same Simon Cordo of Genoa is as often cited as any. But the most celebrated and monumental work of all mediaeval Latin medicine, and still regarded in the later fifteenth and early sixteenth centuries as a greater authority than any work of the intervening period, was the elaborate *Conciliator differentiarum philosophorum et precipue medicorum* of Pietro d'Abano, the famous professor of Paris and Padua. Though it was not finished until 1303, most of its author's life lay in the previous century, and he had been working over the book in class-room lectures and discussions for a decade before its completion. In it over two hundred moot questions for the medical man were argued at much length in scholastic fashion.

Passing from the medical to the legal profession, we may readily recognize the leading legal classic of the century in the *Great Gloss* of Accursius, whom even the humanistic jurist, Cujas, in the sixteenth century, still ranked easily ahead of all Greek or Latin interpreters of the law. The student of the English common law will think also of Bracton. These jurists of the thirteenth century were not necessarily dry-as-dust reading. Not only did the glossators study classical literature and history in order to illuminate the text of the law, but, if we may trust Fichard, who in the first half of the sixteenth century wrote the lives of the leading jurists before his time, the legal works of Odofredus, a professor at Bologna who died in 1265, "are filled with a certain vivid energy and charming method of instruction. For the reader does not seem to be reading him but almost to hear him."

In the domain of political thought the *De regimine principis* of Egidius Romanus, who flourished about 1290, is one of the most familiar treatises of the century and representative of the attitude

of fatherly Christian counsel which was generally offered to potentates until the time of Machiavelli and even sometimes thereafter.

Pietro dei Crescenzi, who was born at Bologna about 1233 and attended the university of his native city, then became a judge, and later served many of the Italian cities in the capacity of *podestà*, might have been expected to devote the leisure of his declining age to the composition of a work on law or politics, when he retired to private life upon his villa or country estate in the neighborhood of Bologna. Instead he produced a work on agriculture, *Liber cultus ruris*, or *Liber ruralium commodorum*, or simply *De agricultura*, which was completed by about 1305 and was to have an enormous future influence. Not only does it depict the agricultural lore and practice of the thirteenth century, but it was so great a factor in the agricultural revival of early modern times that Crescenzi has recently been hailed as the father of modern agriculture. Between 1471 and 1602 the work appeared in some threescore Latin editions and was also made available in Italian, French, Spanish, German, and Polish.

In the fine arts there seems to be no writing of equal importance and influence from the thirteenth century, although it was the great period of Gothic. The notebook of the architect, Villard de Honnecourt, with its drawings of animals from life and other sketches, is a precious relic from those times but does not seem to have been widely known then or in the following centuries.

We should naturally expect a considerable number of our thirteenth-century classics to be concerned with religious and ecclesiastical matters, and such is the case. Everyone would of course include the theological *Summa* of Thomas Aquinas, the most esteemed and influential of all mediaeval theologians, and who still has his followers. In connection with the church service and its symbolism the *Rationale divinatorum officiorum* of William Durand may be ranked as a classic. Of the numerous collections of stories of miracles and tales for preachers to use in their sermons, the *Dialogus miraculorum* of Caesar of Heisterbach and the still unpublished work of Stephen of Bourbon have attained considerable celebrity. But more important than these was the *Golden Legend*

of the Saints by Jacobus de Voragine, which became such a general favorite and whose influence in mediaeval art has been so well demonstrated by Emile Mâle. In order to satisfy the many modern admirers of Saint Francis of Assisi we should perhaps include in our list the *Lives* of him written by Thomas of Celano between 1229 and 1247, or the *Speculum Perfectionis* of disputed date and authorship. A general work of reference and a sort of expositor's Bible was the work which was often briefly referred to as *Mammotrectus*, only the word was very variously spelled by different scribes. A fuller title is *Expositiones vocabulorum super totam bibliam ad usum clericorum pauperum* (*Explanations of Words throughout the Bible for the Use of Poor Clerks*). And yet certain Protestant historians persist in saying that the Bible was not studied before the Reformation, but only the *Sentences* of Peter Lombard. This first section of the work was followed by tractates concerning orthography, antiphonies, responses, legends of the saints, and homilies. *Mammotrectus* was a John or Johannes Marchisinus, a Franciscan friar of about 1300. His book was printed at least four times before the close of the fifteenth century; namely, at Mainz in 1470, at Frankfort in 1476, and at Venice in 1479 and 1493.

Of works written for that very large circulation, the poor scholars or the poor clerics or the poor practitioners of medicine, such as the *Mammotrectus* just mentioned and the *Thesaurus Pauperum*, another widespread example was the *Philosophia Pauperum*, ascribed to Albertus Magnus. It forms or pretends to form a brief epitome of the essence of his numerous longer works on natural philosophy, for the benefit of those numerous individuals who were too poor to buy, or too lazy to read them all. Of this popular introduction to philosophy there are five different families of manuscripts and twenty-three printed editions which likewise divide into five versions. Its long-continued influence is illustrated by the fact that it was taught at the University of Cracow as late as 1777. I should prefer, however, to see Albertus Magnus represented in our list by some one of his detailed works in natural philosophy of undoubted authenticity, such as the *De vegetabilibus et plantis* which has won him the title of the greatest botanist between Theophrastus and Cesalpini,



or the treatise on *Minerals*. Both these works were composed without the help of any treatise by Aristotle as a guide.

A book of the first half of the thirteenth century that had a great currency as late as the Elizabethan Age was that of the Franciscan, Bartholomaeus Anglicus, or Bartholomew of England, *On the Properties (or Natures) of Things* (*De proprietatibus rerum*), from God, angels, and demons through human beings, psychology, and health, and starry heavens, down to terrestrial geography, matter, animals, stones, colors, savors, odors, and liquors. Both manuscripts and incunabula editions of it are very numerous, and it had been translated into French, English, Spanish, and Dutch during the fourteenth and fifteenth centuries. Yet so fleeting is earthly fame that only the other day what is perhaps the leading newspaper in the United States, in stating that the oldest printed book in the English language is alleged to be Trevisa's fourteenth-century translation of the *De proprietatibus rerum*, went on to ascribe the Latin original to "Bartholomew de Glanville, who wrote in the fourteenth century."

Nor may we omit the longer and more elaborate *Speculum Maius* of Vincent of Beauvais, librarian to St Louis, king of France, and tutor of the French royal children. Indeed, if we wished to include a thirteenth-century treatise on pedagogy, we might include his *On the Education of the Royal Children*. To return to his main work, this vastest of mediaeval encyclopedias subdivides into three ponderous sections, the *Mirror of Nature*, *Mirror of History*, and *Mirror of Doctrine*. All three appeared in incunabula editions soon after the invention of printing. The whole work was essentially a compilation and consists in large measure of direct quotations from previous writers pieced together. Vast as it is, however, it by no means exhausts the previous literature and must not be taken as a mirror giving a complete reflection of the accumulated knowledge or stock of ideas of the thirteenth century.

Quite different in tone and method from the *Speculum Maius* was the *Opus Maius* of Roger Bacon, a work critical rather than cumulative, and concentrating its attention upon only certain aspects and departments of thirteenth-century learning. Furthermore, it is

written in a direct, personal style. Yet its interests are those of the culture of the time, whether its advocacy of experimental method and of the study of Greek and oriental languages, or its leanings towards alchemy and astrology. There is no good ground for believing that Roger Bacon was persecuted for a knowledge far in advance of his age, or that he consigned it to a clumsy cipher. His book could not have been written at any other period and may fittingly be listed as a classic of the thirteenth century. In fact, we might further include one or two more specialized works by other authors devoted each to some one of the particular fields in which Bacon was interested. Thus in his favorite subject of *Perspective* (or *Optics*), Witelo, part Polish and part Thuringian by descent, about 1270 A.D. completed a work which may be said to have become the standard treatment of the subject for the Latin world and to have served for several succeeding centuries as an excellent text-book in the field of optical science. Or in the field of practical mathematics upon which Bacon laid stress we might note the *De ponderibus* of Jordanus Nemorarius, no inconsiderable landmark in the history of physics.

Close to science in the thought of the time lay occult science and what we should regard as pseudo-science. The most popular mediæval work of this type was not composed during the thirteenth century but was translated then from the Arabic into Latin by Philip of Tripoli. Subsequently it was translated into almost every European language. This was the *Secret of Secrets* (*Secretum Secretorum*) which purported to have been written by Aristotle for his pupil, Alexander the Great. The book embroiders its occult science upon the border of political science as well as of natural science, and offers counsel on kingship as well as on personal hygiene. Roger Bacon showed his taste for this sort of literature by writing a commentary upon it. A close second to the *Secret of Secrets* in the procession of supposititious occult writings was the book of Secrets attributed to Albertus Magnus (*Secreta Alberti*). It was printed much more often than any one of Albert's undisputedly genuine works and evidently appealed to a wider, if more credulous and less intellectual, audience. The treatise deals with the marvellous virtues

of herbs, stones, and animals. Although probably not by Albert, it was ascribed to him from an early date and had apparently taken form by the end of the thirteenth century.

We must not forget the *Ars Magna* of Raymond Lull (1235–1315), although he devoted more than one treatise to its exposition. This Lullian art was a method of reasoning by use of assorted figures, colors, diagrams, letters, spaces, and the like. It continued to be taught in the Spanish peninsula and the island of Majorca long after Lull's death.

Which historian of the many who wrote during the thirteenth century in Latin or the vernaculars to select is not an easy task. Shall it be Matthew Paris, or the more popular and credulous *Historia Orientalis* of Jacques de Vitry, or the gossip of Salimbene, or the chronicles of a Villehardouin and a Joinville, or such an official compilation as the *Estoria de España* ordered by Alfonso the Wise of Castile, whose astronomical tables have been already mentioned? In the field of geography and travel it would seem that the volume of Ser Marco Polo must take precedence over all else.

Our final selection will be a book in which amusement was combined with instruction, or rather, a game was taken as a pretext for moralizing. Chess, of course, was one of the favorite pastimes of the Middle Ages, and a very popular book, of which manuscript copies abound in European libraries, was the *Ludus scaecorum* (*Game of Chess Moralized*), composed by Jacobus de Cessolis about the year 1290.

Such are some rambling suggestions for a list of thirteenth-century classics, or best-sellers, as you will. Many of them were textbooks or works of reference, but, unlike ours which change every few years, — or at least pretend to do so, — they remained in use and favor for centuries. How significant and valuable then they are in the history of thought and culture! Shall we interpret their long continuance as something of a sign of intellectual stagnation? If so, the reproach will fall upon the centuries which followed and not upon that which, despite the already great accomplishments of the twelfth century, expressed itself in this impressive array of new or standard works.

A Historical Sketch of the Relationship between History and Science

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# A HISTORICAL SKETCH OF THE RELATIONSHIP BETWEEN HISTORY AND SCIENCE

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THE relations between history and science seem not to have been hitherto at all close. It is true that the Greek word, *historia*, might indicate any investigation of the past, of the present or of nature, and that this usage persisted into the middle ages when in Latin anatomical manuscripts of the twelfth and thirteenth centuries one finds a "history of incisions," a "history of arteries," a "history of muscles" and a "history of nerves." It is true that before the present age of specialization a single person was more likely to deal with several fields of knowledge or research. But the number of those whom we know to have been productive in both history and science is not very impressive, partly perhaps because their writings in the one field or the other have been lost. Those who have engaged in both the historical and scientific fields of activity have often kept them in separate compartments rather than effected a happy union between them, and have not necessarily been led either to a historical view of science or a scientific method in history. Calendars have developed into *fasti* and *annals*, and chronologists have often been men of some mathematical or astronomical attainments. The same writers were apt to retail historical anecdotes and yarns concerning animals and other marvels of nature: witness Aelian of Praeneste and the *Deipnosophists* of Athenaeus. Encyclopedists comprised the phenomena of nature and the story of man along with everything else in their loose collections. But such associations are not very impressive. When scientific matter has

been introduced into a history in the past, it has usually been in the nature of a digression.

Dr. Sarton begins the first volume of his recent monumental "Introduction to the History of Science" with Homer, but as my time is somewhat limited, I will pass on immediately to Herodotus, once regarded as the father of history. His epic or dramatic variety of history, largely personal in his first book, in the following survey of the lands of the Near East strews before us a number of valuable bits of scientific or pseudo-scientific lore. But it may be questioned if the Ionian philosophers with their world grounds and evolutionary theories, their scientific curiosity concerning the past, did not approach closer to a true combination of history and science than either he or Thucydides, whose critical and sophistical treatment brought history into closer relation to the theoretical science of the day. And this raises the query whether history shall appeal primarily to the human interest motive, as in Herodotus, or be limited largely to past or even recent politics, as in Thucydides and so much recent American teaching of it, or whether it shall survey the entire past with a scientific purpose and method and with especial emphasis upon the past of those intellectual faculties and that mental life which distinguish man from other living beings and from other objects of scientific investigation.

The ancient Greek who best combined the historical and scientific interests appears to have been Aristotle. It is true that the notion which he handed on

of science as concerned only with eternal and unchanging truth leaves little room for history. But he wrote a *History of Animals*, a *Constitutional History of Athens*, and treated of both the development of Greek literature and the views of philosophers before him. His medieval and early modern influence, however, was far more as a philosopher and a natural scientist than as a historian.

In the Hellenistic period which followed Aristotle, the bookish compilation in libraries of histories from previous histories became largely disassociated from the study of anatomy, astronomy, botany, physiology, and the like; which, while also too inclined to repeat past authors' opinions, seem to have maintained more contact with reality.

With Pliny the Elder, however, in the Roman Empire we come to a man who in his *Historia Naturalis* dealt with science for the most part historically. While he can not be said to have dealt with the past scientifically, he is none the less after Aristotle our outstanding example in antiquity of the union of history and science; and he was until then and for long to come the chief historian of civilization. His vast influence in medieval and early modern times was in the main conservative, anchoring science to previous lore and attaching the ball and chain of past superstition to the winged ankles of Mercury.

The Bible is stronger on its historical than its scientific side, and the same was naturally true of early Christian thought and writing. History was now reviewed and reconstructed as the working out of a divine plan and purpose, but while we have a sort of Christian Pliny in the encyclopedist and chronologist, Julius Africanus, and while such works as the *Hexameron* of Basil cater to an obvious curiosity concerning nature, this apparently existed in the audience more than in the preacher. Christianity has often been called a great historical religion, but until Mrs. Eddy it was seldom ac-

cused of being a great scientific religion. The Schoolmen and medieval theologians nevertheless attempted with the aid of Aristotle to make it such, and to correlate and reconcile Trinity with First Cause, angels with spheres, miracle with natural law and marvel, and, in general, traditional supernaturalism with a rational theory of the universe. The effort to establish this bold synthesis for centuries absorbed many of the most advanced thinkers of the medieval universities, but was already in the fourteenth century questioned by some of the ablest minds among them, was later attacked by humanists and religious reformers, and finally was generally abandoned by an indolent and dilettante early modern society. The study and writing of history at no time had much relation to it, except that the stress laid upon authorities reminds one of historical method. But we must turn back again to the earlier Moslem world.

The wide sweep of Arabian conquest, embracing three continents and joining such distant lands as Spain and Persia in the communion of the same language, promoted a cosmopolitanism and internationalism favorable to the development of history and science side by side. Despite nomadism and fanaticism, travel and study gave breadth of view and insight. It is true that we can no longer regard the Arabic speaking and writing world as the sole channel by which an interest in science flowed first to the later medieval, and then, augmented by a supposed revival of classical science, to the modern world. We now realize that there was always some interest in science during the early middle ages both in the Byzantine Empire and the Latin West, and that the renaissance of the twelfth and thirteenth centuries, far more important scientifically than the later so-called classical Renaissance, was not due merely to translations from the Arabic. At the same time there was much more scientific writing done in Arabic than in any other language from the seventh to the eleventh century.

This Arabic science, like so much of ancient, medieval and early modern science, was mingled with superstition and magic, but was also often marked by rational skepticism and experimental method. It appears to have had much greater effect upon the West than did the Arabic historiography. But for the combination in an Arabic writer of the interest in history and science with a rational attitude one may refer the English reader to the works of Albiruni on India and the *Chronology of Ancient Nations*, both available in translation.

We have just referred to superstition and magic. The pseudo-science of astrology, whose origins have not yet been satisfactorily established but which at least existed in a highly developed form by the Hellenistic and Roman periods, was still further elaborated by writers in Arabic such as Albumasar, and continued upon the same basis into late medieval and early modern times in the West, while it of course still affects all Oriental peoples. Astrology had important relations both to history and to science. Not only were all properties of plants, stones and animals referred to the planets and signs, and the formation and medical treatment of the human body placed likewise under their influence, but we also find the astrological interpretation of history as in the treatise of Alkindi, "the first and only great philosopher of the Arab race," on the duration of the Arabian Empire, or in the theory of great conjunctions of the superior planets as marking transitions and periods in history. Comets and eclipses, too, were no mere natural phenomena but related to the course of human history. Rulers assiduously consulted astrologers; it was important to know the particular constellations under whose influence a given region lay; the date of the founding of a city was as significant as the horoscope of an individual; and annually, at least in fifteenth century Italy, elaborate forecasts of the probable course of events—natural, social, and political—during the

coming year or for each of its four seasons, were issued not by half-educated impostors but by university professors. Never in all probability have history and science been in such close relationship as they were supposed to be brought by astrology.

One reason why Arabic historiography made less impression on the West than Arabic science may be that already in the tenth and eleventh centuries there were several remarkable historians in the Latin world with whom Gerbert can alone be compared in the realm of Latin science, and he, by virtue of his informing letters, was a bit of a historian too. Since the medieval Latin revival of learning in the twelfth and thirteenth centuries there has been a continuous development of science to the present time. In the fourteenth century we have significant criticism and amendment of the Aristotelian physics; in the fourteenth and fifteenth centuries much activity in medicine and astronomy, experimental method in anatomy and surgery. Science to-day would not stand so firm if it did not have these deep foundations. This scientific development seems by and large to have been only slightly affected one way or the other by such historical movements as the so-called Italian Renaissance or humanism, and the Protestant and Catholic Reformations.

The historical writing of the time was more susceptible to their influence. The humanists, who took rather more interest in history than in science, understood classical history and writers better than most of their medieval predecessors had, but this did not necessarily make them better historians or scientists. They were too prone to imitate Livy, to take some such barren subject as *The Carthaginian Domination of Spain before the Punic Wars*. And they ceased to understand the middle ages. Not all historians of the fifteenth and sixteenth centuries were humanists fortunately, but the disparagement of the medieval period became general and has been

usually retained by men of science to this day. A well-balanced estimate of the past was further rendered difficult by the partisanship of Catholic and Protestant historical writers. Their researches, it is true, led them back to the medieval as well as to the early Christian period, but had the regrettable outcome that medieval history was long regarded as a field practically identical with church history.

Meanwhile, however, literary and archeological erudition and textual criticism, aided by the invention of printing, had been making steady strides forward and led to the gradual formulation of something approaching scientific method in historical investigation. Greater toleration and freedom from religious bias also came as a reaction from the Reformation and Wars of Religion. In the course of the seventeenth and eighteenth centuries both history and science also abandoned the astrological point of view. But the Biblical account of pre-Greek history still held the field practically unchallenged in the skeptical eighteenth century of the French *Encyclopédie* and Voltaire. Sir Isaac Newton, for example, was a very sorry historian who tried to fit ancient history to the Procrustean bed of Biblical chronology. Some of the great German philosophers of the eighteenth and early nineteenth century engaged in scientific investigation of a sort, and they almost all had their philosophies of history, but I do not know that there was much connection between these two activities.

But in the meantime the progress of erudition had given rise to histories of learning, of the universities which reached back into the middle ages, and to collections of *Scriptores*. There was almost a craze for writing the biographies and bibliographies of all the illustrious men, and especially the writers, who had been connected with a given city or religious order or university. These histories were much alike and used the works of their predecessors a great deal, but at least they contain

materials or suggestions for the history of science. I mention them for the further reason, however, that historians to-day may be in danger of continuing somewhat the same bookish scholasticism. To a considerable extent historical scholarship of the nineteenth and twentieth centuries has simply followed along and broadened out paths that were laid down in the sixteenth, seventeenth and eighteenth centuries. The much vaunted *Monumenta Germaniae Historica* are after all but a more critical and greatly enlarged sequel to many such preceding efforts: Chevalier is only a digest of the kind of works just mentioned.

Much of this is of course inevitable. Yet if the historian is to arrive at results at all comparable to those of the scientists, he must be original and fertile in his mode of approach, not merely accurate and faithful. Has history yet had its Galileo or Harvey or Newton or Linnaeus or Darwin or Einstein? On the other hand, it must be confessed that the great advance of science has been due even more to the invention of mechanical aids such as the mariner's compass, the barometer, the accurate time piece, the microscope and the telescope, photography, than to the ideas of such individuals. Can history hope for the devisal of such facilitations in method, each opening a whole new world as it were or side of human life to the examining eye? Archeological discovery of the past century and recent years may be said to have had such an effect, extending our vista as far back in time as the telescope has carried it on into space, and to have appealed almost alike to historians and to men of science. Geology and biology alone would hardly have carried the day for evolution without it. Advocates of the New History believe that recent science and thought offer other instruments which may prove almost equally efficacious in extending, correcting, or substantiating our previous knowledge and evaluation of the human past.





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Sanitation, Baths, and Street-Cleaning in the Middle Ages and Renaissance

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## SANITATION, BATHS, AND STREET-CLEANING IN THE MIDDLE AGES AND RENAISSANCE

By LYNN THORNDIKE

**A**MONG the many reproaches made against the Middle Ages one of the most insistent aspersions has been a three-headed slander, barking like Cerberus to this effect. First, that the streets of mediaeval towns were constantly foul-smelling and full of filth, owing to the lack of closed sewers and private or public conveniences, to the custom of throwing refuse into the street, and to the failure of the municipal authorities to clean the pavements. Second, that soap and baths were little known in those benighted days. Third, that these dirty and pestilence-breeding living conditions in the crowded towns were accompanied by a complete lack of anything resembling sanitary legislation and administration or care for public health. So far as I know, very little specific evidence has accompanied these broad charges — or, at least, one could desire a great deal more than has been adduced. One suspects that they have been largely due to prejudice against the Middle Ages and the subconscious impression produced by the survival of some such conditions into rather recent modern times. Therefore, on the assumption that everything has steadily progressed since ‘the revival of learning’ and the Reformation, it has been inferred that conditions must have been much worse in the Middle Ages. If Islip is still a stinking village to-day, think what it must have been when it was the birth-place of Edward the Confessor. If Villeneuve-lès-Avignon smells far from sweet now, what must Avignon itself, on the other side of the Rhone, have been like during the Babylonian Captivity? If a public urinal across the street from my hotel in Florence offended my nose in 1912, how could I have endured the streets from which Dante was exiled in 1302? But this line of reasoning can be turned in just the opposite direction. If in the same year of 1912, in one of the main streets of Troyes, I saw little boys industriously collecting the fresh horse-manure from the pavement into dust-pans and

patting it down with their bare hands into a compressed mass to make room for more (and this is exactly what I did see) — in the Middle Ages, when the townsmen were so much poorer (*sic?* well, perhaps not in Troyes, the thriving commercial centre of the fairs of Champagne) and the towns were so much more agricultural in character or, at least, in closer relation to the surrounding fields, would not a similar disposition of refuse for fertilizing purposes have been promptly negotiated?

Such logic is not infallible, and the idea of progress is a misleading guide in this connection. In England, in 1844, a royal commission found only two towns where refuse was removed at the public expense from the courts and alleys of the slums. How could mediaeval conditions have been worse than that? During the same decade of the nineteenth century, 'three hundred London sewers,' we are told, 'emptied themselves into the Thames above the lowest intake of the water companies.' But back in 1550, when Henry II of France proposed to turn some of the sewers of Paris into the Seine, the municipal authorities vetoed the suggestion on the ground of danger to the public health, since half the population of the city were dependent upon the river for water for cooking and drinking purposes.<sup>1</sup> Formerly sewers had drained into the river, but the municipality had learned its lesson as nineteenth-century England was to learn its. These illustrations serve to warn us against regarding as a lineal heritage from the Middle Ages bad new conditions which actually resulted from the industrial revolution of the eighteenth and nineteenth centuries, and the negligence of early modern medicine. The modern slum has been well described by Perris<sup>2</sup> as a distinctive monument of nineteenth-century industrialism. Havelock Ellis, in his *The Nineteenth Century, An Utopian Retrospect* (1901), has emphasized the presence of human excrement in the life of the common people as has no work on the mediaeval towns, to my knowledge. It seems the part of common sense to hold that, as the mediaeval towns first developed out of country villages, sanitary arrange-

<sup>1</sup> Marcel Poëte, *Une Vie de Cité: Paris de sa Naissance à nos Jours* II (Paris: Picard, 1927), 257, 258 (*La Cité de la Renaissance*).

<sup>2</sup> G. H. Perris, *Industrial History of England* (London: Kegan Paul, Trench, Trübner, 1914), p. 157.

ments would remain crude and gradually become intolerable, just as they did in the new towns or newly crowded quarters of old towns in the England of the industrial revolution and early nineteenth century. That, as the towns reached their height of enterprise and prosperity and intelligence, — and they certainly were possessed of all three to a high degree, — such conditions would be vastly improved. That, as they declined again from their best period and suffered from war or pestilence or misgovernment, there might be a reversion to a less satisfactory state of affairs.

But now let us turn from a *priori* reasoning to something in the way of definite evidence. We may deal first with the third accusation against the mediaeval towns, since it is very easily disposed of. So many instances are known of mediaeval towns maintaining municipal physicians, that it is perfectly absurd to contend that there was no sanitary administration or care for public health. In Milan, for example, not only does Bonvicino de Ripa, in the thirteenth century, state the number of physicians in the city as nearly two hundred, but Galvaneus Flamma, writing in the early fourteenth century, adds that a number of them are salaried by the commune to give free medical attendance to the poor.<sup>1</sup> Hospitals and charitable institutions were also widespread. I have already quoted in my *History of Civilization* (p. 333) the statement of Garnier<sup>2</sup> that practically all the hospitals now existent in Burgundy have come down from the Middle Ages, and that for all modern philanthropic institutions may be found their mediaeval counterparts and forerunners. Similarly the reviewer in the *Revue des Questions Historiques* of the recent work of Dorothy Louise Mackay on the mediaeval hospitals of Paris<sup>3</sup> remarks ‘the use in the public service of the sick in the Middle Ages of many of the “innovations” of our present hospitals,’ and notes that the principles of hospital administration, the recruit-

<sup>1</sup> Galvaneus Flamma, *Chron. Extrav.* Qy. 23, nos. 87, 88: ‘inter quos sunt plures salariati per communitatem qui gratis tenentur pauperes medicare,’ cited by Argellati, *Bibliotheca Scriptorum Mediolanensium* (Milan, 1745), I, xxxi. and edited Ceruti, *Miscellanea di Storia Italia*, VII (1869), 488, 489.

<sup>2</sup> *Chartes de Communes et d’Affranchissements en Bourgogne*, Introduction de Joseph Garnier [who died in 1903], terminée par Ernest Champeaux, Dijon, 1918; pp. 787–960 deal with the subject of charity.

<sup>3</sup> *Les Hôpitaux et la Charité à Paris au XIIIe Siècle*, (Paris: 1923); 168 pp.

ing of the personnel, the internal discipline, have changed but little since the days of Saint Louis.<sup>1</sup> Furthermore, it is now recognized by historians of medicine that the Middle Ages surpassed antiquity in knowledge of contagious diseases and measures taken against infection, especially after the Black Death of 1348.<sup>2</sup> Indeed, these strict mediaeval quarantines excited the ire of a doctor of medicine who in the first half of the nineteenth century wrote the history of the town of Nantes, who regarded them as infringements upon individual liberty and relics of barbarous centuries, and who, in conformity with *his* idea of what constituted progress and enlightenment, looked forward to the speedy arrival of the day when sequestration should be abandoned as a method of preventing the spread of contagious diseases!<sup>3</sup> The fuller statement by him which I have quoted in the note suggests that the mediaeval doctors were

<sup>1</sup> 'Il est piquant de trouver en usage dans le service public des malades au moyen âge quantité d' "innovations" de nos hôpitaux actuels. Les principes d'administration, du recrutement du personnel hospitalier, de la discipline intérieure n'ont guère changé depuis le temps où Louis IX accordait à l'Hôtel-Dieu une insigne protection,' *Revue des Questions Historiques* C (1924), 236.

See also L. Brière, *Collection de Documents pour servir à l'Histoire des Hôpitaux de Paris*, 1881-1887, 4 vols.

I am not qualified to give an at all complete or adequate or well-rounded bibliography of literature on mediaeval hospitals and charities, but it would be easy to fill a page or two with references. In English, interesting information in a small space is given by J. H. Wylie, *The Reign of Henry the Fifth* I (1914), 139, 140, 355, 379, 380, etc., from which I have already made some citations in my paper on 'The Study of Western Science of the Fourteenth and Fifteenth Centuries,' *Medical Life* XXXII (1925), 117-127; cf. esp. p. 120.

<sup>2</sup> See Paul Diepgen, 'Die Bedeutung des Mittelalters für den Fortschritt in der Medizin,' in *Essays on the History of Medicine presented to Karl Sudhoff*, edited by C. Singer and H. E. Sigerist (Zürich: Seldwyla, 1924), pp. 99-120, especially pp. 108-112.

<sup>3</sup> A. Guépin, *Histoire de Nantes* (2d ed., 1839), p. 292: 'En lisant ce qui précède, nous sommes indignés des mesures violentes que prenaient nos pères pour se préserver des épidémies. La suspension de toute liberté individuelle, les cadenas mis aux maisons, sont autant de moyens qui nous révoltent. Prompts à porter un jugement, nous blâmons vivement ces mesures de terreur, et nous déclarons dignes des siècles de barbarie. . . . Nous devons remarquer encore que jamais la séquestration et les mesures les plus rigoureuses n'ont entravé les maladies contagieuses dans leur marche. Une sévérité excessive appelle l'attention des esprits faibles, exagère à leurs yeux les dangers de l'épidémie; la peur du mal fait naître le mal de la peur, et prédispose singulièrement à subir les fâcheuses influences [p. 293] d'une atmosphère qui renferme des miasmes dangereux. Les soins de propreté, les mesures hygiéniques et les moyens propres à distraire les imaginations faibles préservent cent fois mieux une ville du typhus, de la peste ou du choléra, que les cordons sanitaires et les lazarets. Chaque jour cette opinion que les faits historiques confirment [*sic*], acquiert de nouveaux partisans parmi les hommes les plus éclairés, et bientôt les médecins des lazarets, et les autres employés de ces établissements seront les seuls à soutenir une doctrine vieillie, sur laquelle reposent les abus dont ils profitent.'

much closer than he to the germ theory of disease, although he was at least four centuries closer in time, which apparently has its relativities as well as space. But it does seem a bit hard on the Middle Ages that in one century they should be accused of barbarism on the ground of neglecting public health, and in another age for enforcing it. The conclusion of the whole matter seems to be that the charge that the mediaeval towns were unsanitary can be maintained, if at all, only in the narrowest sense of that word, and so reduces itself to the first two of the three charges.

We therefore pass on to the second calumny, that soap and baths were little used in those times. In the general nature of things it would be passing strange if a society which took so many precautions against infection should take none against dirt as a possible source of disease, whatever theories, in part astrological in origin, may have prepossessed them, like the early nineteenth-century historian of Nantes, as to the infectious character of the air. Without arguing the point that some of the means employed against infection, such as costumes much resembling divers' suits and strong aromatics, would be more effective in keeping off insects than in excluding or purifying the air breathed, and seem to indicate an instinctive and empirical, if not fully realized and articulate, sense that fleas and the like might be spreaders of infection — without arguing this, we may simply observe that dirt and filth were then believed to be under the influence of the stars as truly as the air or any other element or compound. Moreover, the belief was general among learned men and students of nature that lower and minute forms of animal life, such as worms and flies, were spontaneously generated from dust, slime, and putrefaction. It therefore seems improbable that mediaeval men would leave filth and refuse lying about in the streets, or allow dirt to collect upon their persons, if they could prevent it.

Once more turning from theories and probabilities to concrete evidence, we may first briefly note the telling fact that bathing was much stressed in mediaeval works of medicine and hygiene. It is true that those who insist upon the dirtiness of the Middle Ages have sometimes interpreted this to mean that men bathed only

when they were sick, but this is obviously unfair dialectic. It shows the same wrongheadedness as those who have used the fact that certain saints were famed, among other austerities, for their neglect of cleanliness of the person, to give the impression that the period was favorable to dirt. Whereas the more natural inference would be that uncleanness was as rare as is saintliness in this sinful world, or, at least, that cleanliness was the normal condition. But the fact which is absolutely destructive to the contention that mediaeval men did not wash with any frequency, is the widespread existence of public baths in mediaeval towns. To the influence of the Roman Empire, with its vast public baths, was added the habits of the German invaders, who in Caesar's day had bathed in rivers even in the depth of winter, and in the time of Tacitus had advanced to the stage of warm baths. And in those parts of Europe touched by the Arabs would be added the influence of the teachings of Mohammed as to personal cleanliness. Thus in a town as far north in the Spanish peninsula as Teruel in Aragon, we find in the statutes of A.D. 1176 careful provisions as to the use and maintenance of the public bath.<sup>1</sup> If we leap across space and time to the Germany of the later Middle Ages, we have evidence of four public baths in fourteenth-century Mainz, while Frankfort-on-the-Main had at least fifteen in 1387, and numbered twenty-nine bath-keepers among its citizens. In the the next century there were eight bathing establishments in Würzburg, eleven in Ulm, thirteen in Nürnberg, seventeen in Augsburg, twenty-nine at Vienna.<sup>2</sup> If the Emperor Wenzel drank more wine than water, he none the less seems to have shared in a high degree the fondness of his subjects for these bathing establishments; so

<sup>1</sup> F. A. Navarro, *Colección de Documentos para la Historia de Aragon*, Tomo II. *Forum Turuli* (Saragossa: M. Escar, 1905), sect. 291, 'De balneis.' I have given the gist of its provisions in my *Short History of Civilization*, p. 323.

<sup>2</sup> Theodore Puschman, *A History of Medical Education* (London, 1891), p. 276.

The history of bathing, and of mediaeval bathing in particular, has received considerable attention in German monographs. Some examples are: Karl Baas, *Mittelalterliche Gesundheitspflege im Heutigen Baden*, 1909; Alfred Martin, *Deutsches Badewesen in Vergangenen Tagen*, 1906; E. Bäumer, *Die Geschichte des Badewesens*, 1903; Kochendörffer, 'Zum Mittelalterlichen Badewesen,' *Zeitschrift f. Deutsche Philologie*, Bd 24; Marcuse, 'Badewesen im Altertum, Mittelalter und Neuzeit,' *Vierteljahresschrift f. Oeffentl. Gesundheits*, Bde. 31, 32 (1899-1900); G. Zappert, 'Ueber das Badewesen Mittelalterlicher und Späterer Zeit,' *Archiv f. Kunde Oesterreich. Geschichtsquellen*, Bd 21 (1858-59).

that the borders of a number of illuminated manuscripts prepared for him, even to the German translation of the Bible in six volumes,<sup>1</sup> are adorned with figures of bathtubs, other accessories of the bath, and either bathing girls or bath-keepers in as scant costume as at modern beaches. From representations of Wenzel himself with them or in stocks appears to have developed the legend that he was freed from prison by a fair bath-keeper named Susanna.<sup>2</sup> It is more likely that the pictures of him are meant to indicate symbolically that she holds his heart in fond captivity. This sensual side of bathing, also emphasized by Boccaccio, should not obscure the fact that the primary purpose of the baths was cleanliness, although mineral baths and the like were much frequented for purposes of health. If we come back from Germany to the lands lying between it and Spain, taking Florence as an example of the Italian town, we find no less than three streets of baths there in the Middle Ages.<sup>3</sup> Or if we turn to France, we find twenty-six bathing establishments listed in the *taille* of 1292, while the *Livre d'Étienne Boileau* includes statutes for the occupation of bath-keeper. Indeed, the latest historian of the French metropolis goes farther than this. M. Marcel Poète does not hesitate to affirm: 'The Parisians of that time had at least one point of superiority to those of to-day: they bathed much more.'<sup>4</sup> And he goes on to say that this general mediaeval practice of bathing disappeared, or began to disappear, with the Renaissance!<sup>5</sup> Herr Bäumer, too, in his history of bathing, notes the decline of mediaeval bathing.<sup>6</sup> Not only, then, is it a libel against the mediaeval townsman

<sup>1</sup> On Wenzel's Bible, see A. Woltmann and K. Woermann, *History of Painting* (English translation by S. Colvin), I (1880), 386.

<sup>2</sup> A. Horcicka, 'Die Saga von Susanna,' *Mitteilungen des Instituts f. Oesterreichische Geschichtsforschung* I (1880), 105-120. He mentions various MSS at Vienna but does not seem to include a handsome astrological one which I examined there in the summer of 1927, and which has the same sort of pictures as the others. As it bears the dates 1392 and 1393, it would seem to antedate Wenzel's imprisonment by the Bohemian nobles in May, 1394, and so to afford further proof that his release was not effected by the bath-keeper Susanna. See Latin MS, Vienna 2352 (Philos. 201), esp. fols 1r and 34r.

<sup>3</sup> Robert Davidsohn, *Geschichte von Florenz* IV, iii (Berlin: Mittler, 1927), 337, 338.

<sup>4</sup> Marcel Poète, *Une Vie de Cité*, I (1924), 620: 'Les Parisiens de ce temps avaient du moins une supériorité sur ceux de maintenant: ils usaient beaucoup plus les bains.'

<sup>5</sup> *Ibid.*, 'Un usage aussi général s'est perdu à dater de la Renaissance.'

<sup>6</sup> E. Bäumer, *Die Geschichte des Badewesens*, published as Heft 7 of *Abhandlungen zur Geschichte der Medizin*, Breslau, 1903.



to assert that he seldom took a bath, but it must be recognized that developed mediaeval society was actually superior in this regard to modern Europe, and that the decline in personal cleanliness came with the decline of mediaeval culture and society.

With this in mind we approach the last trench of those who would denigrate the Middle Ages in the matter of sanitation and cleanliness, namely, the question of the state of the streets and of conveniences in the mediaeval town. On this point it is not to be denied that a certain amount of specific evidence has been adduced to show an unsatisfactory state of affairs; but it is to be doubted if the sweeping generalizations which have been based upon this scattered evidence, which is apt to reduce to a few particular cases somewhat widely separated in place and time, have been justified. In this connection it may be well to reflect a moment as to what sort of evidence should be expected and accepted upon such a matter as social conditions and standards of cleanliness and sanitation. If a society lived contentedly with the streets in a state of 100 per cent filth, this condition, however shocking and deplorable it may seem to us, would evoke no remark or comment from contemporaries, and no records to prove the past existence of such a condition would come down to us. Most of the complaints that have come down to us from the past as to filthy and evil-smelling streets will be found to be applicable to abuses rather than to normal usage, and to testify to the existence in public opinion of higher standards in such matters than the presence of the abuse itself would suggest. Legislation is also notoriously deceptive in such matters. Is a law, and more especially repeated legislation, against nuisances and the like more indicative of their prevalence, or of public activity and sentiment against them? The argument from silence, or from lack of evidence to demonstrate the existence of street-cleaning and sanitation, is equally dangerous. Incidental evidence is likely to be much more valuable, but care must be exercised in interpreting it. In view of such considerations as these, it has seemed to me that those authors of local and town histories who have discussed the condition of mediaeval streets have not presented sufficient convincing evidence to warrant their unfavorable generalizations.

Moreover, such unfavorable generalizations usually acquire added strength in the next repetition. In a review of the second volume of Poëte's history of Paris in the *London Times*,<sup>1</sup> it is asserted of Paris of the Renaissance, or late fifteenth and sixteenth centuries, 'the stench of the streets spread for leagues over the surrounding country,' and in another review in the same newspaper<sup>2</sup> of the latest instalment of Davidsohn's monumental history of Florence we read: 'For Florence, notwithstanding her splendour, was foul, ill-kept and ill-smelling. The strictest regulations were useless to prevent the citizens from depositing filth upon the highway.' I have searched the volumes reviewed in vain for the counterpart of these strong statements. The closest approach that I could find in Poëte was, 'Un souffle de campagne passe sur la ville d'où se dégage en même temps l'odeur nauséabonde d'un entassement humain malpropre,'<sup>3</sup> and 'C'est une ville très sale.'<sup>4</sup> What Davidsohn says is that the street-cleaning left very much to be desired.<sup>5</sup>

Let us examine a little further such specific details as Davidsohn gives concerning the streets and conveniences of Florence of the thirteenth and early fourteenth centuries. He states that Florence had no such regulations and official inspection concerning the cleanliness of street pavements as little San Gimignano had in the thirteenth century, and that not until the Black Death of 1348 were officials appointed to see to the removal of refuse. Again, although public conveniences were constructed at San Gimignano in 1255, the poor of Florence were still using the town wall, ruined buildings, or vacant lots for such purposes as late as the early fourteenth century.<sup>6</sup> If, however, this is to the discredit of Florence, it is equally to the credit of little San Gimignano, and cannot be taken as conclusive evidence against mediaeval towns in general. It is also well to remember that it seems to have been a matter of custom

<sup>1</sup> *Literary Supplement*, November 3, 1927, p. 782.

<sup>2</sup> *Ibid.*, August 25, 1927, p. 571.

<sup>3</sup> Marcel Poëte, *Une Vie de Cité: Paris de sa Naissance à nos Jours*, II, 255.

<sup>4</sup> *Ibid.*, p. 257.

<sup>5</sup> *Gesch. v. Florenz* IV, iii (1927), 262: 'Die Strassenhygiene liess sehr viel zu wünschen übrig.'

<sup>6</sup> *Ibid.*, pp. 262, 263; *Anmerkungen*, p. 74.

rather than statutory legislation in mediaeval towns to hold each householder responsible for the cleanliness of the pavement in front of his dwelling.

Davidsohn grants that by this time it was becoming the rule for the well-to-do to have private conveniences in their houses.<sup>1</sup> In this connection it may be recalled that the feudal castle used to be represented as lacking such facilities until Viollet-le-Duc pointed out the evidence for their existence, and skilful planning and construction to avoid bad odors. Monasteries had their lavatories and latrines, of course, and it will be remembered that sympathizers with Huss made quite an ado because he was imprisoned at the Council of Constance in a room next to the latrines, which indicates that even Bohemians were not accustomed to put up with such odors. I should even be inclined to draw a similar inference from the incident of 1297 at the church of San Lorenzo, of which Davidsohn<sup>2</sup> and his reviewer in the *London Times* make so much.

If we pass on in the history of Florence to a later mediaeval period not yet reached by Davidsohn in his work, we find Salutati, writing in 1399,<sup>3</sup> display a squeamishness as to medical examination of urine and inspection of human excrement, 'disagreeable to smell, foul to the sight, and unsettling to the stomach,' which would scarcely seem consistent with the existence of such filth in large quantities in the streets or open places of the city of which he was not merely a native but the official secretary. Indeed, in a dialogue by Leonardo Bruni (1369-1444) Salutati is represented as saying: 'In magnificence, indeed, Florence perhaps surpasses those cities which are now in existence, but in cleanliness it surpasses both those that are now in existence and all those that ever were. . . . For neither Rome nor Athens nor Syracuse were, I think, so clean and well kept, but in this respect were far surpassed by our city.'<sup>4</sup> A very different

<sup>1</sup> *Gesch. v. Florenz* IV, iii (1927), 331.

<sup>2</sup> His account of it at II, ii (1908), 509, 510, is fuller and gives a slightly different impression from the briefer allusion at IV, iii (1927), 263.

<sup>3</sup> In his *De Nobilitate Legum et Medicinæ*, described in my article on 'Medicine Versus Law in Late Mediaeval and Medicean Florence,' *Romanic Review* XVII (1926), 8-31; see esp. p. 27.

<sup>4</sup> Theodor Klette, *Beiträge zur Geschichte und Literatur der Italienischen Gelehrtenrenaissance* II (1889), 67, 68: 'Leonardi Aretini ad Petrum Paulum Istruin Dialogus,' liber II.

estimate this from the English reviewer's: 'Florence, notwithstanding her splendour, was foul, ill-kept and ill-smelling.' Bruni was even more specific on the same point in his *Eulogy of the City of Florence*, in which he remarks that some towns are so dirty that whatever filth is made during the night is placed in the morning before men's eyes and to be trodden underfoot, 'than which it is impossible to imagine anything fouler. For even if there are thousands there, inexhaustible wealth, infinite multitude of people, yet I will condemn so foul a city nor ever think much of it. For just as there cannot be felicity in a deformed body, although it may possess all other excellencies, so there can be no beauty in cities, if they are filthy, although all other advantages may be present.'<sup>1</sup>

Perhaps the safest conclusion in regard to the cleaning and sanitary status of mediaeval streets would be that some towns were satisfactory in this respect and others not, or that the same town varied at different periods. This is further borne out by the Italian humanist, Fausto Andrelini of Forlì, who taught at the University of Paris in the later years of the fifteenth century and addressed a vivid complaint as to the filthy condition of the streets of the French capital and objectionable personal practices of its inhabitants in the form of a Latin poem to Budé.<sup>2</sup> Yet at this very time inhabitants

<sup>1</sup> Klette, *cit. sup.*, 'Leonardi Aretini Laudatio Florentinae urbis,' pp. 87, 88.

<sup>2</sup> *Publii Fausti Andrelini Foroliviensis poete laureati ad Guillelmum Budeum Parrhisiensem patricium, graeca et latina litteratura insignitum, de influenza syderum et querela Parrhisiensis pavimenti carmen*, 1496. The poem will scarcely bear translation into English, but a few lines of the original may be given to illustrate its character. L. Thuasne called attention to it in his article, 'Rabelaisiana,' *Revue des Bibliothèques* XIV (1904), 281-304. I have read the original incunabulum edition at the British Museum:

Ast ego continuo turbe pede calor euntis  
 Et curru infelix preterunte terror,  
 Et iactam ex altis urinam poto fenestris,  
 Mingit et in media sexus uterque via.  
 Undique merda fluit puerorum infecta cacantum  
 Et ventri pateo spurca latrina gravi.  
 Stercora quinetiam brevibus resoluta cucullis  
 In non tergendam deiiciuntur humum.  
 Suavior ut fiat triplici mixtura sapore  
 Immundum effundit lota culina situm.  
 Principio ignarus solum putat advena cenum  
 Et damnat multo sordida strata luto.  
 Clamat et, O verum sortita Lutetia nomen,  
 Quam bene sunt fame congrua facta tue.

of Paris successfully objected to the presence of a potter in their neighborhood because of the disagreeable odors that his occupation involved.<sup>1</sup> Erasmus was another foreigner to inveigh against the filthiness of the streets of Paris at the beginning of the sixteenth century, but we must of course infer therefrom that the conditions of which he and Andrelini complained did not exist in their native towns or other habitual haunts. Poëte, in his history of Paris, does not state that the condition of the streets declined with the Renaissance period, as he did state of the public baths, but he certainly does not show an improvement,<sup>2</sup> although in 1554 there were 800 carts to remove filth twice daily. But a document of 1270 shows the existence then of an official, with assistants, to care for the streets, and the specific instances of uncleanness which Poëte gives date from the time of the Hundred Years' War and Black Death,<sup>3</sup> when the city was depopulated and disorganized, and hence probably do not represent the best conditions of mediaeval Paris.

Some early modern towns were apparently dirtier than those of the Middle Ages, and others cleaner. We have strong descriptions of the filthiness of the streets in a new royal capital like Madrid in the sixteenth and seventeenth centuries. On the other hand, on August 1, 1621, James Howell wrote of Venice: 'I admired her magnificent buildings, her marvelous situation, her dainty, smooth, neat streets, whereupon you may walk most days in the year in a silk stocking and satin slippers without soiling them.'<sup>4</sup> But of course Venice, with its canals, was an exceptional case.

No very positive position, then, would yet seem possible as to the sanitary condition and care of the streets in times past, and the Middle Ages in especial. What we need is less mud-slinging and more facts. If the foregoing discussion serves to check the former somewhat and to encourage the production of more of the latter, it will have achieved its purpose.

<sup>1</sup> Poëte, *Une Vie de Cité*, II (1927), 56.

<sup>2</sup> *Ibid.*, II, 254-258.

<sup>3</sup> *Ibid.*, I (1924), 613-619.

<sup>4</sup> *Familiar Letters*, quoted by H. D. Sedgwick, *Ignatius Loyola* (New York: Scribner's, 1923), p. 162.



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Vatican Latin Manuscripts in the History of Science and Medicine

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## Vatican Latin Manuscripts in the History of Science and Medicine.

This paper is the outcome of six weeks spent in the summer of 1927 in the Manuscript Study Room of the Vatican Library in the endeavor to obtain some idea of the materials there available in the Latin language, especially for the history of science. During the hot summer months in Rome the Vatican library is open only in the morning from eight to half past twelve, and some religious holidays also intervened, but I tried to avail myself to the full of every precious moment.

Besides the ordinary collection of Latin manuscripts which runs into five figures, the Vatican of course has other rich collections of Latin manuscripts which have been acquired at one time or another, such as those amassed by Queen CHRISTINA OF SWEDEN in the seventeenth century (shelf-marked Reg. Suev. etc.), or those which once belonged to the ill-starred Elector of the Palatinate (shelf-marked Palat. lat. etc.). There is the Barberini collection, of which the mere inventory fills twenty-three volumes, and the Ottobonian collection, to mention only those of most importance for our present purpose, although the Codices Rossianae also offer a few items of interest. So far as Latin manuscripts are concerned, only a small beginning has been made towards printing catalogues of these collections. The old catalogues in long-hand are accessible only at the Vatican and usually give very brief and insufficient descriptions of the codices and their contents. It is to be earnestly hoped that the recently announced gift of the Carnegie Corporation to the Vatican Library may be expended not primarily in introducing American library methods and cataloguing the printed books, most of which are probably accessible elsewhere, but rather in pushing on the publication of scientific catalogues of its manuscript collections which are so important, yet still to such an extent a closed book to scholars and researchers. Those parts of the collections where works on philosophy, nature,

medicine, mathematics, and the occult sciences congregate in the manuscripts, have seldom been reached in the printed catalogues thus far issued.

Since the Vatican library took form only near the close of the middle ages, its collections of manuscripts are rather more apt to be of value to one investigating the science and medicine of the fourteenth and fifteenth centuries than that of the twelfth and thirteenth. Its manuscripts of early medieval works are likely to be late copies and on this account inferior to codices available elsewhere. Indeed, in some cases its manuscripts of medieval works are as late as the seventeenth or eighteenth century and may even be copied from a printed edition. While the catalogues thus far printed by the Vatican library have included relatively few of its scientific manuscripts in Latin, others have been noted, described, or edited in various publications by individual scholars and investigators. As a rule it is my intention not to mention such manuscripts again, and to try to confine this survey to those which have not received previous attention. But no doubt some of these previous notices have escaped me. In general, too, those manuscripts of which notices are available in the catalogues already printed will not be included here. Thus *Codices Vaticani Latini* 1-678, 1401-2059, 9852-10700; *Codices Urbinales Latini* 1-1000; *Codices Palatini Latini* 1-921, are purposely omitted from present consideration.

Even so, this account will necessarily be very sketchy and incomplete, since there was time for only a rapid and superficial examination of the old written catalogues and of a very limited number of manuscripts. No doubt, too, a subjective element is not wholly absent from the process of selection. Works by well known authors, such as in medicine JAMES OF FORLI, GENTILE DA FOLIGNO, THOMAS and DINO DEL GARBO, MARSILIUS DE SANCTA SOPHIA, were usually passed over without troubling to ascertain whether these particular Vatican manuscripts of their works had been noted and utilized or not. On the other hand, it has sometimes seemed advisable to mention an early manuscript of an important work, although the work is available in print and the manuscript in question perhaps not entirely unknown. Works on logic will be omitted, as will be for the most part those on astrology, alchemy, and magic.



The reader's indulgence must further be craved for errors which undoubtedly will find their way into so hurried and fleeting a survey. The old catalogues in longhand have presumably failed to include some manuscripts, have omitted important items in others, and in other respects require revision and amplification. Often they give no date for a manuscript or ascribe it to too early a century. Sometimes I reproduce these conjectural datings as better than nothing; in a few cases I have found more exact evidence. But in most cases there was no time for such delicate matters as a determination of the date or provenance of a manuscript or its various component parts. These desiderata must await the scientific cataloguing of the manuscripts by trained palaeographers. The present aim is merely to give a glimpse, necessarily brief and imperfect, of some of the opportunities for an investigation of the history of science in the Latin manuscripts of the Vatican collections. The most convenient method of presentation seems to be a roughly alphabetical one by authors and subjects. Since medieval men usually did not have any last or family name, I have, with a few exceptions such as SACROBOSCO in place of JOHN HOLYWOOD, listed authors by their first or Christian names.

1) To ALBERTUS MAGNUS are ascribed in the catalogues some unfamiliar titles, but the items in question would probably turn out to be either excerpts from the known works of ALBERT or treatises incorrectly ascribed to him. « An Oil against all things which are contrary to human nature, » might possibly fall in the former category, though I should not know where to look for it in ALBERT's printed works. (1) To the latter category belongs a « Summa concerning the vices contracted in the study of theology, (2) » which is really by ROGER BACON. It is followed by

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(1) Vatic. lat. 2482, fol. 166, ALBERTUS THEUTONICUS, *Oleum contra omnia contraria nature humane*. « ALBERT THE GERMAN » may be some other Albert than the Dominican of Cologne and bishop of Regensburg. In Vatic. 5377, fol. 137r, a treatise on waters is ascribed to ALBERTUS DE ALAMANNIA. Henceforth I shall omit the usual designation « lat. » from the shelf marks of manuscripts cited, since I commonly refer only to Latin codices.

(2) Vatic. 5004, fol. 1. For other MSS see the Bibliography of BACON's writings in *Roger Bacon Essays*, edited by A. G. LITTLE, 1914, p. 407, where reference is made to the discovery of the work by Drs. NOGARA and PELZER and the Rev. H. M. BANNISTER of the Vatican library.

a *Tractatus directionis*, (3) likewise ascribed to ALBERT in the old catalogue.

« A Treatise of questions on the forms appearing in mirrors, » which is ascribed to ALBERTUS PREDICATOR in a Vatican manuscript (4) and elsewhere, has already been listed as « ALBERTUS PRAEDICATOR, Katoptrik » by BJÖRNBO in the « Handschriftenbeschreibung » at the close of his study in collaboration with S. VOGL of *Alkindi, Tideus und Pseudo-Euklid.* (5) It seems not to have been printed.

2) A *Practica* of « BROTHER ALBERT THE COMMENTATOR, (6) » is probably one of the numerous works of alchemy attributed to ALBERTUS MAGNUS. Others occur in the Vatican collection, (7) including the *Semita recta* (8) which is so often and perhaps correctly represented as his. The manuscripts of the *Speculum astronomiae* at the Vatican (9) consistently support the attribution of that work to ALBERTUS MAGNUS and lend no countenance to the attempt of Father MANDONNET to foist it upon ROGER BACON. (10) The *Secrets of Albert* concerning the virtues of herbs, stones, and animals are ascribed to the Dominican of Cologne in one manuscript at the Vatican (11) and to ALBERT OF SAXONY in an-

(3) *Ibid.*, fol. 22, Eiusdem tractatus directionis, Incipit, « Accipe tabulam plenam... »

(4) Vatic. 2975, 16th century, fols. 151v-56v, « Incipit tractatus questionum ALBERTI predicatoris super formis in speculis apparentibus. Queritur de forma... / ... differentiam uisibilitatis. Et haec de rationibus speculorum sufficient. Explicit tractatus ALBERTI predicatoris de rationibus speculorum. » I repeat this description from BJÖRNBO for the reader's possible convenience.

(5) *Abhandlungen zur Geschichte der mathematischen Wissenschaften*, XXVI, 3, 1912; see especially pp. 139, 141, 143.

(6) Vatic. 4425, fol. 277, Fratris ALBERTI comentatoris practica. Incipit, « Oculorum calida... »

(7) Vatic. 4091, fol. 42, opening, « Talentum mihi traditum... »; Palat. 1330, ALBERTI MAGNI de chemia.

(8) Vatic. 4092, fol. 1, opening, « Omnis sapientia... »

(9) Vatic. 4275, fols. 18-28, « Explicit libellus gloriosissimi viri domini ALBERTI quem edidit de libris astronomie. » Palat. 1340, fols. 75r-82v, « Incipit tractatus ALBERTI MAGNI de refutatione librorum nigromanticorum et approbatione librorum astronomicalium... / ... Explicit tractatus ALBERTI MAGNI de refutatione librorum astronomicalium. Sit laus deo. » Palat. 1445, ALBERTI MAGNI *Astronomia*.

(10) See my *History of Magic and Experimental Science*, 1923, vol. II, chapter 62; and P. MANDONNET, « ROGER BACON et le *Speculum astronomiae*, » *Revue néoscholastique*, vol. XVII, 1910, pp. 313-35.

(11) Palat. 1248, ALBERTI COLONIENSIS Ord. Praed. *Secreta*.

other (12). From a third codex one might receive the impression that a PAUL OF LIMOGES had compiled the *Secrets* from other writings of ALBERTUS MAGNUS, but a closer examination suggests that PAUL was responsible only for some extracts from ALBERT's works on natural philosophy which follow the *Secrets* in the manuscript in question. (13) A *De mirabilibus mundi*, found in a Vatican manuscript, does not seem to be the work of that title ascribed to ALBERT, since it has a different Incipit. (14)

3) Another treatise current under the name of ALBERTUS MAGNUS whose authenticity has been questioned is the *De secretis mulierum*. WICKERSHEIMER has recently shown that, whether by ALBERT or not, it certainly was not by HENRY OF SAXONY, for whom it had been claimed. (15) Of fifty-five manuscripts of the work listed by WICKERSHEIMER only one is from the Vatican, (16) but there is at least one other copy of it there, (17) while a third manuscript contains a commentary upon it which the catalogue ascribes to GENTILE DA FOLIGNO, the medical writer of the fourteenth century (18). The item in Vatic. 9018, fol. 76, which the

(12) Vatic. 4482, fol. 79, ALBERTI DE SAXONIA de virtutibus herbarum lapidum et animalium. But ALBERT OF SAXONY flourished in the middle of the fourteenth century and some manuscripts of the work appear to antedate this.

(13) Vatic. 4864, bound in boards. After a single leaf from an older, very regularly written, and legible codex of the same treatise, and a blank fly leaf, the text begins afresh with illuminated initials. An the close, fol. 10r, col. 2, occurs the Rubric, « Expliciunt secreta sceu experimenta fratris alberti in secretis eius super libros naturales compilata a magistro PAULO DE LIMOGIS. » But what PAUL appears to have done is to add other « secrets » and « experiments » from ALBERT's other works to the usual text of the *Secreta Alberti*. Thus the next line, also a Rubric, reads : « Frater ALBERTUS super libro de animalibus. » At fol. 13r, col. 1, « Hucusque albertus super libro de animalibus. Nunc albertus libro galieni de plantis. » At fol. 14v, col. 2, « Hucusque albertus super libro de plantis, nunc super libro de mineralibus ; » fol. 16r, col. 1, « Hucusque albertus super libro de mineralibus. Item ibidem super libro de anima » ; and so on for the *De coelo et mundo*, *De proprietatibus elementorum*, and *Meteororum*.

(14) Reg. Suev. 1770, fol. 129, opening, « Cum natura... »

(15) ERNEST WICKERSHEIMER, « HENRI DE SAXE et le De secretis mulierum, Communication faite au 3<sup>e</sup> Congrès de l'histoire de l'art de guérir, Londres, 17-22 juillet, 1922 ; printed at Antwerp, 1923, 8 pp.

(16) Palat. 310, 14th century, fols. 144-148v.

(17) Palat. 1170.

(18) Vatic. 4456, fols. 1-30. I could see no mention of GENTILE in the treatise itself, but later in the same MS occurs an addition to the Anatomy of MUNDINUS which is sometimes ascribed to GENTILE, for instance, in a MS at Venice : S. Marco XIV, 43 (Valentinelli), fols. 92-93.

catalogue describes as « ARISTOTELIS Problemata seu secreta mulierum, » might turn out to be either the work ascribed to ALBERTUS MAGNUS, the *Secret of Secrets* of the PSEUDO-ARISTOTLE, or some third work. (19)

4) Of the *Mathematica* or *Astrologia* of ALHANDREUS or AL-CHANDRUS, apparently one of the earliest works to be translated from Arabic into Latin, there is a manuscript at the Vatican (20), although it is centuries later than those of the British Museum and Bibliothèque Nationale already studied (21).

5) An anonymous Almanac of the planets from 1243 to 1303 A.D. is found in Vatic. 4572, a small parchment folio, while in another codex of the same collection (22) is discussed the science of making an almanac, that is, a table (*Tacuinum*) (23).

6) An unfamiliar discussion of the medical matter of critical days is found in a question by AMICUS OF SULMONA in 1397 whether the fourth day announces the seventh, and whether the eleventh forecasts the fourteenth. (24)

7) ANDALÒ DI NEGRO of Genoa, whom BOCCACCIO eulogized (25) both as his old teacher of astronomy and one who by extensive travel had acquired a wonderful knowledge of the world and *savoir faire*, and who had been ambassador for his city at the court of Trebizond, is represented in the Vatican manuscripts by both astronomical treatises and works of astrological medicine. (26)

(19) It is badly written in a fifteenth century hand and is bound up with two printed books.

(20) Vatic. 4084, fols. 11-14v, ALHANDREI philosophi Saracenorum Astrologia, opening, « Igitur quoniam in hac arte utilissimum esse videtur... » This portion of the MS is membrane and in a hand not earlier than the thirteenth century. The rest of the MS is paper and written in a still later hand.

(21) Concerning them see my *History of Magic and Experimental Science*, I, 710-715. It has been questioned if BN 17868 is of the tenth century, but there can be no doubt that the Latin text goes back at least to the eleventh century. Palat. 1416, Alexandri Mathematica, is presumably the treatise which I mention at p. 714.

(22) Vatic. 3099, fol. 9, De scientia faciendi Almanach, idest Tacuinum.

(23) On the use of this Latinized Arabic word in titles of astronomical and medical works see my Query and the Answer of Dr. GEORGE SARTON, *Isis*, 10, 1928, pp. 489-93.

(24) Vatic. 2469, (JACOBI DE FORLIVIO questiones super Tegni GALENI).

Item AMICI DE SULMONA questio de diebus creticis vel utrum dies quarta annunciat septimam et undecima quartamdecimam disputata de anno 1397. »

(25) *De genealogia deorum*, XV, 6.

(26) Vatic. 4082, fols. 196r-209r, de iudiciis infirmitatum; fol. 209, de infusione

PIETRO BONO AVOGARO, doctor of arts and medicine and professor at the University of Ferrara, who emended the treatise on the astrolabe by ANDALÒ DI NEGRO in the printed edition of 1475 and had earlier edited the *Geography* of PTOLEMY, wrote treatises in both astronomy and astrology, some of which are found in Vatican manuscripts. (27)

8) In another manuscript are works on the stars and their motion and upon comets by an author whom I have failed thus far to identify, ANDREAS DE SOMMARIA. (28) In the former treatise he gives the current year as the 2136th of the era of NEBUCHADNEZZAR (29), which would correspond to 1389 A. D. This is confirmed by his dating PTOLEMY's astronomical observations in about the 880th year of the era of NEBUCHADNEZZAR. (30) He opens with the attention-arresting statement, « Whether the motion of the stars can be known I do not know, but that it is not yet known I most certainly hold. » (31) He is impressed by the weakness of human sense which is unable to make full use of astronomical instruments. (32) Indeed, on the fly leaf at the beginning of the whole manuscript the treatise of ANDREAS is given the title, « That astrology (or, astronomy) cannot be known. (33) » He appears, however, to be more skeptical as to our comprehension of the motion of the heavenly bodies than he is as to their astrological influence (34).

9) As an example of little known medical works comprised

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spermatis. Vatic. 4085, 14th century, fol. 11, *Canones iudiciorum infirmitatum*; ol. 28r, de infusione spermatis; fol. 28v, de ratione partus. Vatic. 5906, de compositione astrolabii. See further my Query, « ANDALÒ DI NEGRO, PROFACIUS JUDAEUS, and the Alphonsine Tables, » *Isis*, 10, 1928, pp. 52-56.

(27) Vatic. 6253, *liber computi de luna*. Vatic. 5373, fol. 4, a brief astrological tract, « Actum ferrarie die ultimo feb. anno a natali christiano 1475 per me PETRUM BONUM ADUOGHARIUM artium et medicine doctorem. »

(28) Vatic. 989, fols. 57r-69v, de stellis et motu earum; fols. 70r-81r, de cometis.

(29) *Ibid.*, fol. 65r, « a principio regni NABUCHODONOSOR ad diem istum qui est anni 2136 ipsius... »

(30) *Ibid.*, fol. 64r.

(31) *Ibid.*, fol. 57r, « Motus stellarum an sit scibilis nescio. quod ipse nondum sit scitus certissime teneo. »

(32) *Ibid.*, fol. 58r, « Postquam demonstratum est fore impossibile acquirere scientiam motus celi propter debilitatem sensus non valentis comprehendere habitudinem partium instrumenti. »

(33) The brief table of contents reads: «CLAUDIANUS de statu animae — ANDREAS DE SOMMARIA quod astrologia non possit sciri — Tractatus de cometa. »

(34) I have procured a photostat of his treatises for further study.

in the Vatican manuscripts may be mentioned a commentary on the first section of the *Aphorisms* of HIPPOCRATES, by ANGELUS DE PERGULA, doctor of arts and medicine, who was possibly of the same family as the later PAOLO DELLA PERGOLA or PAULUS PERGULENSIS, public lecturer on philosophy in Venice, who in 1448 refused a bishopric and died in 1451. The commentary of ANGELUS was copied or edited in 1397 by MELCHIOR JOHN OF GUBBIO. (35) The records of the University of Padua show that ANGELLUS DE LA PERGULA received his doctorate there after less than a year's residence. (36)

10) Among medieval manuscripts of Latin translations of the works of ARISTOTLE in natural philosophy Barberini 165, a thick codex of the thirteenth century, may be of some importance. (37) Most of the translations are anonymous. The manuscript opens with the fourteen books of the *Metaphysics* except that the first part of book one is gone. The older Latin translations included only its first twelve books. There follow the eight books of *Physics*, the *De coelo et mundo* translated from the Greek, *Generation and Corruption*, *Meteorology*, *De sensu et sensato*, *De memoria et reminiscencia*, *De somno et vigilia*, *De motu animalium* (but not the *De animalibus*), *De iuventute et senectute*, *De spiritu et respiratione*, *De morte et vita*, *De bona fortuna* (an excerpt from the *Ethics*), *De causis* with the commentary of PROCLUS. *De lineis indivisibilibus*, the supposititious *De pomo*, described as usual as translated from Arabic into Hebrew and then from Hebrew to Latin by MANFRED, son of FREDERICK II. Then come *De intelligentia*, *De vegetabilibus et plantis*, described as usual as translated from Greek into Arabic and thence into Latin, *De coloribus*, *De causis proprietatum elementorum* in part only, *De inundatione*, *De progressi animalium*, and *Physionomia*. There is also a medical extract, dated 1288, from the *Secret of Secrets* of the PSEUDO-ARISTOTLE to ALEXANDER. Sandwiched between the last of these items are the *De differentia spiritus et anime*, commonly ascribed

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(35) Vatic. 9420, 14th century, 193 fols. Expositio super particula prima aphorismorum recollecta per MELCHIOREM IOANNEM DE EUGUBIO anno 1397 : « Dimissis que in primo librorum solent adduci... / ... die Sabathi. Deo gratias. Amen. »

(36) ANDREA GLORIA, *Monumenti della Università di Padova* (1318-1405), 1888, I, 454; II, 119.

(37) Barb. 165, membr., 415 fols.

to COSTA BEN LUCA, the work of SECUNDUS PHILOSOPHUS, Bishop MARTIN's *Formula vitae honestae*, and AVERROES *de substantia orbis*. They are followed by tracts or extracts ascribed to BOETHIUS, AQUINAS, and ALBERT, or without name of author (37).

11) Ottob. 2254 is a thirteenth century copy of WILLIAM OF MOERBEKE's translation of SIMPLICIUS's commentary on the *De coelo et mundo* which is not mentioned by GRABMANN who quoted the translator's statement at the end of the work from Balliol College Ms 99 of the fourteenth century. (38)

12) The Vatican appears to possess a thirteenth century copy of the *Colliget*, or chief medical work, of AVERROES in the Latin translation made by the Jew, BONACOSA, at Padua in 1255 (39).

13) On the first leaf of a Vatican manuscript, in very abbreviated writing, is a chapter on floods ascribed to AVICENNA. (40) Both he and AVERROES were cited on that theme by ALBERTUS MAGNUS and other medieval writers, especially anent the question of the possibility of generation after a universal deluge. In another manuscript, after better known works by AVICENNA, come a *Sermo* on the generation of stones, another on the generation of mountains, and a third on the generation of mineral bodies (41). The opening words of the first *Sermo* are those of the *De congelatione et conglutinatione lapidum*, (42) of which E. J. HOLMYARD and

(37) *Ibid.*, fol. 402v, BOETHI de fluxu maris, BOETHI de iride, BOETHI de duratione mundi, BOETHI de unitate; fol. 405v, de fractionibus vulgaribus; fols. 406v, de figuris geomancie; fol. 407, de signis tempestatum; fol. 407v, de mixtione elementorum; fol. 408, THOME DE ALBINO de motu cordis (probably it is really the work of ALFRED OF ENGLAND); fol. 408v, THOME DE AQUINO de essentia; fols. 411v-414v, ALBERTI de impressionibus factis in aere. GRABMANN, *Forschungen über die lateinischen Aristoteles-Uebersetzungen des XIII Jahrhunderts*, 1916, alludes to this manuscript but only for the *De pomo*.

(38) GRABMANN, *op. cit.*, pp. 148-9.

(39) Vatic. 9412, 13th century (according to the catalogue), 86 fols., Mehemeth AVERROIS de medicina libri septem : « Quando ventilata fuit... / ... deo gratias. Amen. »

(40) Vatic. 4426, fol. 1r-v, AVICENNE capitulum de diluviis.

(41) Vatic. 4428, fol. 114, Sermo de generatione lapidum, opening, « Terra pura non fit... »; de generatione montium, opening, « Montes vero quandoque... »; fol. 125, de generatione corporum mineralium, opening, « Corpora mineralium... »

(42) Another Vatican manuscript of it, Vatic. 9941, 15th century, fol. 72, has already been noted in the printed catalogue covering numbers 9852-10300, VATTASSO e CERUSI, *Codices Vaticani Latini*, Vol. IV, Rome, 1914.

D. C. MANDEVILLE have recently printed both the Latin and Arabic text with an English translation (43)

14) Of the treatise of BARNABAS DE RIATINIS of Reggio on foods, completed at Venice in November, 1338, to which I called attention in 1926 (44) on the basis of a manuscript (45) at the Laurentian library in Florence, there is another manuscript at the Vatican. (46).

15) A *De proprietatibus rerum* in Barberini 473 (XI,116), 15th century, 236 double-columned fols., is represented by the long-hand catalogue of that collection as unpublished and by RABANUS MAURUS. An examination of its text shows that it the work of the thirteenth-century writer, BARTHOLOMAEUS ANGLICUS, which has been more than once printed. The Barberini manuscript is written in several hands, some of which are very neat.

16) A number of the works of BARTOLAMMEO DE MONTAGNANA have been printed, but so far as one can judge from their titles, the *De abortu*, which appears in Palat. 1316, is not among them. BARTOLAMMEO DE MONTAGNANA, professor of medicine at Padua, received the doctorate in 1403 (47), from which date on to 1450 his name appears constantly in the university records. (48)

17) JOHN JAMES BARLOTTI of Parma is a name for which I have looked elsewhere in vain. But in Vatic. 5376 are contained dated works by him. The first, *Opusculum antiquitatis medicine*, dedicated to NICCOLÒ MARIA D'ESTE, bishop of Adria, which office he held from 1487 to 1507, is a sketch of the history or antiquity of medicine delivered at the beginning of BARLOTTI's extraordinary lectures on AVICENNA at the University of Ferrara in 1498 (49). The sketch does not come down beyond ancient

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(43) *Avicennae De congelatione et conglutinatione lapidum, being sections of the Kitab al-Shifa*, Paris, 1927. (*Isis*, 11, 134) The Latin text had of course been printed before in old collections.

(44) « Another Treatise by BARNABAS DE RIATINIS of Reggio, » *Isis*, 8, 285-6.

(45) Gaddi reliq. 209.

(46) Vatic. 3714, fols. 1-67r, « Incipit Compendium de naturis et proprietatibus alimenterum per magistrum BARNABAM aggregatam (?) Venerabili patri GUIDONI CONCORDIENSI episcopo directum... »

(47) A. GLORIA, *Monumenti* (1318-1405), 1888, I 441.

(48) ZONTA e BROTTI, *Acta graduum*, 1922, where his name occupies a solid column of figures in the index.

(49) Vatic. 5376, fols. 1-18v, opening, « Antiquorum principum, reverendissime presul... » Its main divisions as indicated by headings scattered through the text may be reproduced to give an idea of how the history of medicine was then



medicine, and may probably be regarded as called forth by the interest in classical antiquity of the humanistic movement. The next work in the manuscript on the nature of demons was compiled by BARTOLOTTI from the Platonists on December 13, 1498 and also at the University of Ferrara (50). The other treatise by him which occurs later in the manuscript is a medical *Tractatus complexionum* (51), dated 1520 and described as « published for himself and his posterity (52). »

18) The work of BENEDICT OF NURSIA or BENEDICTUS REGUARDATUS or BENEDETTO DI REGUARDATI on the preservation of health appeared several times in incunabula editions, of which the *princeps* at Rome was addressed to SIXTUS IV by the printer. But of two manuscripts of the work at the Vatican one is addressed to ASTORGIUS AGNESI, archbishop of Benevento from 1436 to 1451, and governor of the March of Ancona at the time of BENEDETTO's writing (53) — as is another manuscript of it which I

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envisaged: fol. 2r, Medicina ex divinatione et vaticiniis; fol. 2v, Medicina ex cognitione herbarum simpliciumque medicaminum; fol. 3r, Medicina experimento habita; fol. 3v, Medicina a casu, Medicina ex insomniis; fol. 4v, De medicina ex magia; fol. 5r, Medicina ex astrologia et imaginibus; fol. 5v, Medice facultatis variis munctores (?) ex doctissimorum hominum auctoritate; fol. 6r, Indorum medicina; fol. 6v, Aegyptiorum medicina; fol. 8r, De AESCYLAPIO et graecorum medicina; fol. 9r, Cur AESCYLAPIO medicine inventum in APOLLINEM retulit; fol. 9v, Redargutio opinionis negantis medicos fuisse a bello Troiano usque ad Peloponnesicum; fol. 10r, De PYTHAGORA DEMOCRITO EMPEDOCLE et aliis quibusdam gloriosissimis medicis; fol. 12r, De medicine artis inconstantia ac varietate et eius sectis; fol. 12v, De logica sive rationali heresi et chirurgia; fol. 13v, Qui maxime in rationali medicina medici claruerunt ex veteribus; fol. 14r, De ARISTOTELE peripatetico; fol. 15v, De GALENO pergamensi; fol. 16r, Qui ex recentioribus in hac maxime heresi emicuerint; fol. 16v, Empirica heresis; fol. 17r, Methodica secta; fol. 18r, Epilogus totius opusculi. »

(50) *Ibid.*, fol. 20r, Eiusdem IOANNIS IACOBI BARTHOLOTI parmensis tractatus de natura demonum 1498 13 decembris in ferrariensi gymnasio compilatus ex platonis. I think that it includes what the catalogue of manuscripts lists separately as « Eiusdem excerpta ex libro PSELLI de demonibus, » at fol. 23, and probably also the « Differentia inter veneficium et magiam » at fols. 24v-25r. In general the manuscript is written in detached paragraphs with considerable space intervening, as if a first draft or assorted jottings.

(51) Its leaves are renumbered 2-29, or would be 61-88 of the whole manuscript. It opens, « Complexio est qualiter... »

(52) *Tractatus complexionum* JOANNIS IACOBI Parmensis quem sibi ipsi posterisque suis aedidit. »

(53) Barberini 279, fols. 1r-87r, Ad Reverendissimum in Christo patrem et dominum dominum ASTERGIUM AGNENSEM beneventanum archiepiscopum Marchie Anconitane Gubernatorem BENEDICTUS REGUARDATUS NURSINUS phisicus de

have seen at Florence (54); while the other is dedicated to Pope NICHOLAS V himself (55). From what I have seen of the treatise in the manuscripts — I have not had access to the incunabula editions of it — it is eminently sensible and well expressed for its period and deserves critical republication. It in part represents the author's own experience. Among other things he warns against the danger of coal gas from fires indoors at night which he says has caused several deaths. REGUARDATI was an important personage in his day. He taught at Perugia as early as 1426, and in 1438 was one of the two envoys appointed to plead with FRANCESCO SFORZA for clemency to Norcia. Later, when he was banished from his native town, he took refuge with SFORZA whose physician he became. When SFORZA became duke of Milan, he was in high favor, appearing in the documents of the University of Pavia (56) in 1447 as one of SFORZA's two *locum tenentes*, while his name heads the list of commissioners to reform the university, and he alone by general consent is exempted from the rule that no person not a citizen should be Prior or *Numerarius* of the College of Arts and Medicine. At this time he did little teaching, for while in a provisional *rotulus* of the faculty for 1448-1449 his name is down to lecture at will (57) for the handsome stipend of 600 ducats, a comment is added which leads us to infer that he was unlikely actually to deliver any lectures (58). Despite the fact that MARINI over a century since in his work on papal physicians (59) maintained that REGUARDATI was not one, NEUBURGER in his recent history of medicine (60) has represented him as physician

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conservanda sanitate. « Summo cum studio decet emergentes morborum insidias deprimi... »

(54) Cod. Biscioniani 25, 15th century, fols. 1-18, De sanitatis conservatione ad reverendissimum in Christo Patrem et precolendissimum Dominum D. ASTORGIUM AGNENSEM Neapolitanum (*sic*) Anconitane Marchie Gubernatorem.

(55) Vatic. 6266, fols. 11-73v, « Pulcherrimum et utilissimum opus ad sanitatis conservationem editum ab eximio artium et medicine professore Magistro BENEDICTO DE NURSIA tunc serenissimi et potentissimi ducis Mediolani medico Ad s. in Christo patrem et d. n. D. N. divina providentia S. Pon. Incipit foeliciter. »

(56) See the *Codice diplomatico dell'università di Pavia*, published by the Società pavese di storia patria, Pavia, 1913, II, i, pp. 507, 512-13, 516, 540.

(57) *Ibid.*, p. 540, « Ad lecturam beneplaciti ».

(58) *Idem*, « M. Benedictus, si staret cum lectura, esset utilior ceteris. Sed quia non stat, faciat Dominus ut vult de sallario. »

(59) G. MARINI, *Degli architri pontifici*, Rome, 1784.

(60) Vol. II, p. 443.

to SIXTUS IV. This may be a mistaken inference from the Roman printer's dedication of the *De conservanda sanitate* to that pontiff. REGUARDATI is also known for his treatise on the pest.

19) BENVENUTUS or BENEVENUTUS GRAPHAEUS or GRASSUS of Jerusalem wrote on the eyes and their diseases and cure in the twelfth century. His work was printed in incunabula editions and has received considerable recent attention (61), including new editions from manuscripts (62). The two Vatican manuscripts of BENVENUTO's work have not been utilized in these new editions but they have been briefly described by ALBERTOTTI in his account of the manuscripts and editions of the work. The reason I refer to them again is that ALBERTOTTI has somehow confused the descriptions of the two Vatican codices (63). Thus Vatic. 5373 is not of the sixteenth century, does not contain BENVENUTO's treatise at fols. 29]-63r, and does not describe it as « The new art of BENEVENUTUS of Jerusalem concerning diseases of the eyes, translated from the Hebrew tongue into Latin. » All these points apply rather to Reg. Suev. 373. In Vatic. 5373 the treatise occurs at fols. 166v-181v and is said at the close to have been copied by ANGELUS CARDINALIUS, a philosopher and medical man, on April 3, 1475 at Perugia — all which features ALBERTOTTI incorrectly predicates of the other manuscript. He likewise transposes their opening and closing words.

20) Palat. 1380 is catalogued as « BERNARDI DE VERDUNO de celis. » Probably it is the same as his *Tractatus super totam astrologiam* of which there is a brief account in the *Histoire littéraire de la France* (vol. 21, pp. 317-320) based on two Paris manuscripts (BN 7333 and 7334). This informs us that the work is strictly

(61) G. ALBERTOTTI, « L'opera oftalmojatrice di BENVENUTO nei codici, negli incunabuli, e nelle edizioni moderne, » *Memorie della Regia Accademia di scienze, lettere ed arti in Modena*, Serie II, Vol. XII, 1896, *Memorie della sezione di lettere*, pp. 27-101. CHAS LABORDE, *Bienvenu de Jérusalem et son œuvre. Le ms. 176 de Metz, reproduction diplomatique*, Montpellier thesis, 1901, 76 pp. See also P. PANSIER, *Janus*, 9, 1904, pp. 6-9.

(62) Besides the reproduction of the Metz MS by LABORDE, just mentioned, A. M. BERGER and T. M. AURACHER, *Benvenutus Graphaeus Practica oculorum*, 1884-1886, edited the work from two Munich MSS (CLM 259 and 331), and from a Breslau and Basel MSS., while ALBERTOTTI, « I codici Riccardiano, Parigino ed Ashburnhamiano dell'opera oftalmojatrice di BENVENUTO, » in the aforesaid *Memorie* of the Modena Academy, Serie III, Vol. I, 1898, *Sezione di lettere*, pp. 3-88 reproduced the texts of those three manuscripts.

3) See his aforesaid article of 1896, p. 33.

astronomical in character and contains no judicial astrology. It has ten parts. In one Erfurt manuscript it is called *Liber super totam astronomiam cum tabulis* (64), and in another *Speculum celeste* (65). BERNARD OF VERDUN was a Franciscan professor who wrote about 1300., one of the manuscripts of his work being written in the early fourteenth century.

21) Cardinal BESSARION, who died in 1472, figures as the principal speaker in an anonymous dialogue « De scientia Dei, de rerum contingentia, et de predestinatione, » in a fifteenth-century manuscript (66), where it follows two works of SCOTUS. It is not included in the edition of BESSARION's works in MIGNE's *Patrologia Graeca* and apparently is not noted in the modern works on BESSARION of VAST, MOHLER, and ROCHOLL.

22) The Vatican contains a number of manuscripts of works in the fields of physics and astronomy by BLASIUS, or BIAGIO PELACANI, of Parma who taught at Pavia, Bologna and Padua from at least 1377 to 1411, dying in 1416. But they have long since been noted by AFFO in his literary history of Parma (67), although what he describes as Barberini 732 appears now to be numbered 357.

23) JEAN BODIN's *Colloquium heptaplomeres de rerum sublimium arcanis abditis*, a discussion of matters of religion by representatives of seven different persuasions, was regarded as bordering so closely upon heresy, infidelity, and atheism that it was not printed until the nineteenth century. (68) CHRISTINA OF SWEDEN had difficulty in procuring a copy for her library, (69) and it is probable

(64) Amplon. Folio 393, fols. 22-43.

(65) Amplon. Folio 386, about 1359 A. D., fols. 1-25 : despite the variant title, its Incipit, « Quia ex scienciis fructu dignioribus... », shows it to be the same treatise as is found in the other manuscripts.

(66) Vatic. 9402, opens, « Paulus apostolus...; » closes, « ... naturali potentie attribuit. »

(67) IRENEO AFFO, *Memorie degli Scrittori e Letterati Parmigiani*, 1789, II, 119-125; also the continuation by PEZZANA, VI (1827), iii, 133. A fuller and more precise account of BLASIUS's career may now be made out from the university records of Bologna, Pavia, and Padua than is given by AFFO or, more recently, by DUHEM, *Système du monde*, IV, 278. I have attempted to do this in an article, « Blasius of Parma, » in *Archeion*, 9, 1928, 177-190.

(68) I have examined it in the Latin edition of 1857. A French edition was published in 1914 by ROGER CHAUVIRÉ.

(69) DAN .GEO. MORHOF, *Polyhistor*, 1732, Vol. I, p. 71.

that Reg. Suev. 1313 (70) is the manuscript which was finally obtained for her.

24) A *Quadripartitus of moral figures* by a Dominican named BONJOHANNES OF MESSINA to his nephew PRINCIVALLUS (71) seems to be a moralizing work on nature like the *Septiformis de moralitatibus rerum nature*, since it opens with a citation of the *Problems* of ARISTOTLE and is found in the same manuscript with an anonymous medical work called the *Portior medicinarum* or *Liber experimentorum* (72). QUETIF and ECHARD give our Dominican's name as BONJOANNES DE MESTANA and the title of the work as *Volumen quadripartitum per fabulas figurarum moralium*. The year 1343 has been suggested as his date, but it is not clear on what grounds (73). Presumably he is not to be identified with TOMMASO BONGIOVANNI of Sicily, also mentioned by QUETIF and ECHARD, MONGITORE, and MAZZUCHELLI — who died about 1350 but was born at Palermo.

25) Charms, conjurations, and superstitious prayers are found scattered through the Vatican collections as they are in other collections of medieval manuscripts (74).

26) The work of CHRISTOPHER DE (or, A) BONDELMONTIBUS, a Florentine priest and traveler, on the islands of the Cyclades to the Cardinal JORDANES in the early fifteenth century was not unknown earlier, but was first published as a whole (75) in 1824

(70) If the catalogue may be trusted, it gives the title in a slightly different word order from the 1857 edition : « Colloquium Heptaplomeres de abditis rerum sublimium arcanis. »

(71) Vatic. 4462, fols. 65r-91v, « Incipit quadripartitus figurarum moralium quas scripsit frater BONJOHANNES MESSANE ordinis predicatorum princivallo nepoti suo. »

(72) *Ibid.*, fols. 33r-54v, « Explicit liber experimentorum qui dicitur fortior (*sic*) medicinarum. » By « Portior » is presumably meant « portitor, » since on the first illuminated page of the treatise is a picture of a man with a book in his hands and a panier on his back.

(73) QUETIF et ECHARD, *Scriptores Ordinis Praedicatorum*, Paris, 1719, p. 616b, « F. BONJOANNES DE MESTANA laudatur a Lusitano p. 17, qui nec nationem nec aetatem addit. Excipiunt GOZZEUS, PIUS, FERNANDEZ et tandem ALTAMURA ad 1343, qui tamen nullam ampliorem ex veteribus monumentis lucem afferunt. Itaque penes eos fides. »

(74) The following will serve as examples of what I mean : Vatic. 4476, fol. 88, *Varia ad tempestatem*; Vatic. 4864, fol. 59, *Oratio ad pestem verissima*, « Aga + Ada + Ala + ».

(75) Its description of Constantinople had previously been excerpted and printed.

by G. R. L. DE SINNER from manuscripts of the Bibliothèque Nationale, then the royal library, at Paris. I have not been able to examine this edition, but it presumably makes no use of a manuscript of the work at the Vatican. (76)

27) Comets, and particularly that of 1472, receive considerable attention in manuscripts at the Vatican. Ottob. 874, 2484, and 2493 deal with comets. In Vatic. 7806A, fol. 39 there is an anonymous treatise on comets, followed at fol. 48 by a discussion of that which appeared in 1472. In Palat. 1438 is a Judgment by NICOLAUS HARTMAN of the significance of the comet of 1472. We have already spoken of the treatise on comets by ANDREAS DE SOMMARIA; those of MATTHAEUS DE AQUILA and of WILLIAM BECCHIUS will be mentioned later.

28) Manuscripts of works by CONSTANTINUS AFRICANUS (c. 1015-1087) are numerous both in the Vatican and Palatine collections.

29) Vatic. 3165 is a manuscript of the work of Cardinal GASPAR CONTARINI, *De elementis eorumque mixtionibus*, which was published posthumously at Paris in 1548.

30) Manuscripts of the treatise by COSTA BEN LUCA (QUSṬĀ IBN LŪQĀ AL-BA 'LABAKKĪ) *On the Difference between Soul and Spirit* in the Latin translation by JOHN OF SPAIN are so numerous that it is hardly worth while to call attention to Vatican 4426, where it is followed by the pseudo-Augustinian *De spiritu et anima*, (77) or to Barberini 165 where it is ascribed to ARISTOTLE.

31) Vatic. 5321 contains treatises on counterpoint by PROSDOCIMO DE BELDOMANDIS, PHILIPPUS DE VITRIACO, and JEAN DE MURS. All three of these treatises have been printed in E. DE COUSSEMAKER's *Scriptores de musica medii aevi*, 1863-1876, 4 vols. But he seems not to have used this manuscript, since he mentions no Vatican manuscript for the works on counterpoint of PHILIP

(76) Barberini 270, 15th century paper, 51 fols. Liber archipelagi insularum... quem misit de civitate Rhodi Romam domino IORDANO Cardinali de Ursinis anno domini M C<sup>mo</sup> XXX<sup>mo</sup>. This date appears to indicate 1432, whereas NEGRI and FABRICIUS assigned 1422 as the date of the treatise. Another manuscript of it in Spain is Escorial f. II. 17, 15th century, 176 fols.

(77) Vatic. 4426, fol. 37, CONSTABEN LUCE Phisicus de differentia que est inter spiritum et animam IOANNE HISPALENSE ex Arabico in Latinum interprete, « Interrogasti de differentia... »; fol. 41, Augustinus de spiritu et anima.

and JEAN, though he refers to one, without giving a shelf mark, for that of PROSDOCIMO.

32) In Palat. 1340, fols. 15v-17, occurs one of the manuscript versions of « the cylinder called the horologe of travelers, » of which I am treating more fully in a separate note.

33) In a manuscript of the Ottobonian collection a « *Philosophy* of Master JOHN DATUS on all the sciences, combining the knowledge of all in common », is sandwiched between two arguments or *sophismata* of HENRY OF GHENT (78). JOHN DATUS's work appears to be too brief to be of much consequence, and is probably more philosophical than scientific, since his other writings, mentioned by GANDOLFO (79) and FABRICIUS (80), are concerned with ARISTOTLE and logic, AUGUSTINE and theology. Whether JOHN DATUS died in 1360 or 1460 has been disputed, and also whether he was bishop or even bishop-elect of Imola.

34) What are catalogued as distinct astronomical treatises by DOMINICUS DE ARETIO in a Vatican manuscript (81) would probably on further examination turn out to be sections of the encyclopedic work, *De mundi fabrica* or *Fons memorabilium universi* of DOMINICUS BANDINUS OF AREZZO, a friend of PETRARCH, who lived on to complete his work about 1415 (82). It has not been printed and appears in the manuscripts chiefly in the form of fragments and extracts.

35) In another Vatican manuscript is a commentary on the *De coelo et mundo* by DOMINICUS DE CLAVISIO (83). He is apparently the same person as the DOMINICUS DE CLAVISIO, CLAVASIO, or

(78) In Ottobon. 2520, a collection of a number of old manuscripts on parchment bound between or mounted on paper, the work of JOHN DATUS extends from fols. 253r-258v. « Explicit philosophia magistri IOHANNIS DACI super omnes scientias et tradens cognitionem omnium in communi. »

(79) D. A. GANDOLFO, *Dissertatio historica de ducentis celeberrimis augustinianis scriptoribus*, Rome, 1704, pp. 210-211.

(80) *Bibl. mediae et infimae Latinitatis*, citing JOSEPHUS PAMPHILUS in *Chronicis ordinis fratrum Eremitarum S. Augustini*.

(81) Vatic. 3121, fol. 1, de celo, signis, et imaginibus celestibus, opening, « Iuvat me diu versatum... »; fol. 23, de stellis errantibus, opening, « Quoniam celos... »

(82) For an account of BANDINUS see L. MEHUS, *Vita di Ambrogio Traversari* which forms the preface to PETRUS CANNETUS's edition of TRAVERSARI's Letters : I, 1759, pp. cxxix-cxxxi.

(83) Vatic. 2185, DOMINICI DE CLAVISIO *questiones de coelo et mundo*, opening, « Circa lib. de coelo... »

CLAVAGIO in five manuscripts of the Stadtbibliothek at Erfurt (84), four of which contain his *Practice of Geometry*, while the fifth includes a question by him on the *Sphere*, presumably of SACROBOSCO. Since all these Erfurt manuscripts are of the fourteenth century and include one copy of his geometry made at Prag in 1368, he must have written somewhat before that date. One manuscript describes the geometry as composed by him at Paris; another speaks of him vaguely as « the astrologer of one of the kings of France. » He is not mentioned by such historians of mathematics as CANTOR and DAVID EUGENE SMITH, nor in the published records of such universities as Bologna and Padua, nor by FABRICIUS. But CHEVALIER, without, however, noting any of the aforesaid manuscripts or his interest in geometry and astronomy, identifies him with a DOMINIQUE DE CHIVASSO or DOMENICO DI CIVASSO — Clavasium being the Latin form for Chivasso near Turin — whom TIRABOSCHI, following DU BOULAY, described as a member of the College of Constantinople at Paris and a popular professor of philosophy there in 1349 (84) — an unlikely date for large classes, following directly as it does after the year of the Black Death. I might add that the College of Constantinople has usually been represented as without students in the fourteenth century (86).

36) Of some of the books of experiments or experimental books, which were discussed in my *History of Magic and Experimental Science* (87), there are further manuscripts in the Vatican collections. The experiments of JOHN PAULINUS with the powdered skin of a snake, entitled *Salus vitae*, occur in at least three codices (88). The « Experiments of a Chancellor » occur in a Palatine manuscript, but in this instance the Chancellor is neither called GILBERT nor expressly associated with Montpellier (89). There are several

(84) See the descriptions of Amplon. Folio 37, 393 and 395; Quarto 299 and 352 in WM. SCHUM, *Beschreibendes Verzeichniss der Amplonianischen Handschriften-Sammlung zu Erfurt*, Berlin, 1887.

(85) BULAEUS, *Historia universitatis parisiensis*, 1608, Vol. IV, p. 954. TIRABOSCHI, *Storia della letteratura italiana*, 1807, Vol. V, i, 236; 1823, V, i, 355.

(86) See C. JOURDAIN, « Un collège oriental à Paris au XIII<sup>e</sup> siècle, » in his *Excursions historiques*, 1888.

(87) Vol. II, chaps. 43, 63, 64, 65.

(88) Vatic. 4476, fol. 52; Vatic. 4864, fol. 17; and apparently Vatic. 4425, ol. 138.

(89) Palat. 1199, fols. 11-6v, Incipiunt experimenta cancellarii. Some of the



copies both of the *Medical Experiments* attributed to GALEN which open, «Dixit GALENUS, Ignis qui...» (90), and of those, commonly called *Secrets of Galen* which begin, «Rogasti me amice...» and are addressed to MONTEUS (91). In Palat. 1328 «GALENI liber secretorum super elixir solis et lune», seems a different treatise, presumably alchemical (92). From the meager description in the catalogue one would infer that Reg. Suev. 1129 (93) contained the *Secrets* or *Aphorisms* of RASIS (ABU BAKR MUHAMMAD IBN ZAKARIYA AL-RAZI), but an examination of the text itself might show it to be some other of these books of experiments or secrets. Unspecified medical secrets are contained in manuscripts Vatic. 7273, 7274, and 7275, while in Palat. 1268, 1272 and 1273 are *Experimenta diversorum*. In Vatic. 4462, besides the *Portior medicinarum*, already mentioned, at fol. 33, there is «another book of experiments» at fol. 55 (94). Experiments of a MASTER TADEUS occur in a medical manuscript, so that probably THADDEUS OF FLORENCE (1223-1303) is the author meant (95). Medical experiments of BENJAMIN THE JEW are found in Palat. 1211. In Palat. 1394 a are «Experiments of Invisibility,» that is, how to become invisible, while Vatic. 4425 contains both medical conjurations and experiments. Thus the collections of «Experiments» in the Vatican manuscripts bear out that mixture of medicine, chemistry, and magic which we observe in similar collections elsewhere.

37) JACOBUS FABER Stapulensis, or JACQUES LEFÈVRE d'Étaples, is generally given prominent mention in histories of the Reforma-

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topics treated are : De capillis; fol. 2v, Ad tumorem oculorum que subito fit in oculis; fol. 3v, Contra dolorem aurium; fol. 4r, Ad dentes mortuos; fol. 5r, Syrupus conferens pstiticis et consumtis.

(90) Vatic. 2416, fol. 62; 2418, fol. 84; 2385, fol. 266; 4437, fol. 26.

(91) Vatic. 2375; 2385; 4422, fol. 9, where they are anonymous but identifiable by the Incipit; Barberini 166, 14th century, fols. 42v-47v. The catalogue's description of Palat. 1205, «Gallieni Secreta,» is insufficient to indicate whether it is the work addressed to Monteus.

(92) On the subject of works of alchemy ascribed to GALEN in the middle ages see my *History of Magic*, etc. II, 783-4.

(93) Reg. Suev. 1129, fol. 67, AVEU BUBACHAR MAHUMETIS filii liber secretorum.

(64) It opens : «Recipe vitellum unius ovi...» (Take the yolk of an egg).

(95) Vatic. 4422, fols. 58-84, «Omnes herbe et radices...» G. PINTO, *Taddeo da Firenze o la medicina in Bologna nel XIII secolo*, 1888, has discussed works of THADDEUS contained in Vatic. 2418, but I do not recall his mentioning Vatic. 4422 and no longer have access to his monograph.

tion, of French humanism, and of the Christian Renaissance, but that he wrote a work on natural magic in six books is seldom, if ever, remarked. Such a treatise is ascribed to him, however, in a Vatican manuscript (96). It must be confessed that, despite its title, it has more to do with magic than with nature or science and so scarcely comes within the scope of our present survey.

38) FERNANDUS OF CORDOVA was a boy marvel who came out of the Spanish peninsula like young LOCHINVAR from the west in the fifth decade of the fifteenth century, ready like PICO DELLA MIRANDOLA later to dispute with all comers (97). The Vatican contains two treatises by him, one on the art of knowing everything, and involving scientific classification, addressed to Cardinal BESSARION (98), the other on diagnosis from urine (99).

39) The treatise of FIRMINUS DE BELLAVALLE on weather prediction, written in 1320 and already known in the printed editions of 1485 and 1539 and in a Paris manuscript (BN 7482), is found in a Vatican manuscript with the title, *De impressionibus aeris* rather than *De mutacione aeris*, while the authors' name is spelled FIRMINIUS (1).

(40) Vatic. 2463 is a handsome, illuminated manuscript, written in double columns with large margins, of medical works of GALVANUS DE LEVANTO of Genoa, who was physician to Pope BENEDICT XII and became a priest in 1338. He modestly refers to himself as the « shadow of a physician » (*umbra medici*), and appears to have remained somewhat in the shade so far as historians and bibliographers are concerned. FABRICIUS and JÖCHER allude

(96) Reg. Suev. 1115, fols. 1-96r, IACOBI FABRI Stapulensis de magia naturali ad clarissimum virum germanum ganaum regium gubeinatore libri sex. I find that RENAUDET, *Préforme et humanisme à Paris* (1494-1517), 1916, pp. 151-3, has given some account of the work and Latin quotations from it. Another manuscript of it is Brussels 10875.

(97) See BONILLA Y SAN MARTIN, *Fernando de Cordova* (1425-1486?) y los orígenes del renacimiento filosófico en España, 1911.

(98) Vatic. 3177, De artificio investigandi et inveniendi natura scibiles ad BESSARION Cardinalem, 62 fols. Incipit, « Quos vides inter scholasticos et praestanti ingenio viros... »

(99) Reg. Suv. 1773, fols. 49r-61r, De secretis humane dispositionis per urinam dignoscendis ad nobillissimum virum GUIDONEM BARBUTI.

(1) Palat. 1340, fols. 209v, col. 1-242r, col. 1, « Incipit prologus in FIRMINIUM de impressionibus aeris. Quia in multis voluminibus sapientes antiqui de mutationibus aeris... / ... infinita prestigia apparebunt ho. in eodem libro de prestigiiis usque ad finem. Explicit FIRMINIUS de impressionibus aeris. »

only to ascetic writings by GALVANUS preserved in the Bibliothèque Nationale, Paris, and say nothing of our Vatican manuscript or the medical works which it contains. Possibly they are mentioned by MARINI (2), to whose work I do not at present have access. In the Vatican manuscript we find first a long work on the stomach and indigestion in three parts, of which the second has ninety-nine chapters, (3) then a cure for catarrh, (4) next a cure for diseases of the joints (5), and finally a brief tract of spiritual medicine (6). GALVANUS is indeed devout in tone throughout the manuscript but that does not debar it from being of some medical and historical importance.

41) The Vatican has several manuscripts of medical works by ANTONIO GUAINERI, or ANTONIUS DE GUAYNERIIS, professor of medicine at Pavia where he is mentioned in faculty lists of 1412-1413 and 1448 (7). NEUBURGER Vol. II (1925) p. 128 therefore is somewhat inaccurate in placing his death about 1445. His pest tractate is fairly well known and is said to occur in Vatic. lat. 2482, but I have no note to that effect. Palat. 1194 has medical works by him; Palat. 1221 contains his treatise on fevers; Palat. 1214 includes his pest tractate and also a work on intestinal complaints (8), in five sections devoted respectively to diarrhoea, *lyenteria*, colic, dysentery, and *tenasmon*. Vatic. 3163 gives his work on diseases of women which is dedicated to PHILIP MARIA, duke of Milan, and therefore was written before 1447 (9). But

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(2) G. L. MARINI, *Degli archiatri pontifici*, 1784, I, 60-64; is the citation for GALVANUS which I take from CHEVALIER.

(3) Vatic. 2463, fol. 11, In nomine domini nostri iehsu christi Amen. Thesaurus corporalis prelaturum ecclesie dei et magnatum fidelium GALVANI IANUENSIS DE LEVANTO umbre medici contra nocumentum digestionis stomaci rubrica. « Quantuncumque scientia medicine quis polleat... »

(4) *Ibid.*, fol. 69r, Remedium salutare contra catarum GALVANI IANUENSIS etc. It has a preface and twelve chapters.

(5) *Ibid.*, fol. 78v, In nomine summi medici Iesu Christi amen. Incipit primus liber Paleofilon curationis langoris articularum multiplicis dolorosi GALVANI IANUENSIS DE LEVANTO umbre medici ad ven. arch. ramen. dominum ALBERTUM de flisco, opening, « Proficiscor quempiam non delectat nisi amor invitet... »

(6) *Ibid.*, fols. 110-114v.

(7) See the *Codice diplomatico*, II, 123, 534-535, 538-539.

(8) Palat. 1214, fols. 71r-117r, ANTHONII GUAYNERII papiensis de fluxibus ventris tractatus incipit, « Volens de intestinorum egritudinibus doctrinam ponere... / ... Et in hoc ani egressionis cura finitur. Laus deo. »

(9) Vatic. 3163, fol. 11, Rubric, « Incipit tractatus de egritudinibus propriis mulierum ad magnanimum principem PHILIPPUM MARIE anglum mediolani ducem

his work on poisons in Vatic. 8759 is also addressed to FILIPPO MARIA, yet bears at the close the date 1451, which may be that of copying it (10). A briefer version of this treatise on poisons is found in Palat. 1214, where it forms the second part of a treatise to FILIPPO MARIA on the pest and poisons (11). Indeed in the longer version of Vatic. 8759 it also is described as the second part of a treatise, but the first part on the pest is not included in that manuscript. There are at least two incunabula editions of GUAYNERIUS's work on pest and poisons (12), but I do not know how they relate to the two versions of the manuscript text.

42) Of the *De habitudine causarum et influxu nature superioris* (13) *respectu inferiorum* of HENRY OF HESSE, the fourteenth century schoolman, in which he discusses the fundamental hypothesis of astrology, there is a rather poorly written and illegible copy in Vatic. 3088, opening at fol. 14, « Quia libenter scire... » This and his *De reductione effectuum spiritualium* (14) *in causas communes* formerly occurred in Vatic. 9369, a codex of the fourteenth century, but are now missing. Other treatises apparently ascribed to HENRY are still found in this manuscript: — *De discretione spirituum*, *De speculo anime*, *Utrum secundum naturalem philosophiam sint alique substantie separate preter motores orbium*, *Questio de*

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et papie anglerieque comitem ac Ianue dominum. » Opens, « Nichil est, princeps magnanime, ut rem statim agrediar... » At fols. 3r-4v is a table of contents of the 37 chapters. The treatise ends at fol. 80v.

(10) Vatic. 8759, fols. 1r-94v, « Incipit secunda pars principalis huius tractatus materiam continens venenosum cuius in initio tabula ponitur capitulorum. » The table of contents extends to fol. 4v. An fol. 94v we read: « Explicit secunda pars principalis huius tractatus que est de venenis et sic finitur totus tractatus tam scilicet de peste quam de veneno. Ad illustrissimum principem dominum dominum FILIPUM MARIAM anglum Mediolani ducem et cetera Papie anglerieque comitem atque Ianue dominum. Editum per ANTONIUM DE GAYNERIIS de Papia inter artium et medicine doctores minimum et cetera. Deo nostro iocunda sit laudatio. Millesimo quadragesimo quinquagesimo primo decimo die Mensis decembris. »

(11) Palat. 1214, fols. 5r-70r, rubric, « ANTONII GUAYNERII papiensis ad s. d. d. PHILIPPUM MARIAM anglum vicecomitem mediolani ducem etc. papie anglerieque comitem ac ianue dominum de peste ac venenis tractatus incipit. » Opens: « Ad te, principum et ducum illustrissime, cuius immortalitas non minus diis quam hominibus grata est... » The second part on poisons begins with a table of contents at fol. 47r.

(12) Hain 8097 and 8101. The dated edition is that of Pavia, 1481.

(13) The word *communis* sometimes appears instead in the title.

(14) In other manuscripts of the work this word is either entirely omitted or some such reading as *particularium* or *specialium et mirandorum* takes its place.

*substantia demonum*, and *Tractatus de astronomia* (or, *De spera*). But except for the last these deal with the realm of spirits rather than of nature.

43) The HENRY OF MALINES, to whom a treatise on critical days is ascribed in Palat. 1211 (15), is presumably the same as HENRY BATE of Malines, known for his astronomical and other writings (16) and translations.

(44) Hermetic books are not absent from the Vatican collections. *De speculis et luce* (Of mirrors and light) was hitherto known to me only from a citation in Cecco d'ASCOLI's early fourteenth-century commentary on ALCABITIUS, but an Ottobonian manuscript contains « Flowers of Hermes extracted from the book *De speculis et luce* (17) ». Despite the title, the contents are entirely astrological. A few leaves further on in the same codex is a *Sermo hermetis de accidentibus rescriptus ab Haly* (18). The more familiar treatise on fifteen stars, fifteen stones, fifteen herbs, and fifteen images, ascribed now to HERMES, now to ENOCH, is found in two Vatican manuscripts as by HERMES (19). The Palatine collection has the treatise of HERMES on images of the planets (20), another treatise on constellations (21), and « Secrets of JAMES according to HERMES. (22) » The two last named are perhaps something new and require further examination which I did not have time to give; I cite them merely from the catalogue.

45) Two manuscripts of the *Hieroglyphics* of HORAPOLLO in

(15) Palat. 1211, 15th century, fols. 89-100, « Explicit tractatus de diebus criticis a magistro HEINRICO compilatus, dicto de Malinis. Requiescat in pace. » This manuscript has already been mentioned by J. A. F. ORBAAN, *Bescheiden in Italie omtrent Nederlandse Kunstenaars en Geleerden*, Eerste Deel, « Rome. Vaticaansche Bibliothek, » 's Gravenhage, 1911, page 111, No. 137.

(16) Of these his *Speculum divinatorum et quorundam naturalium* is found in Vatic. 2191, fols. 6-336v, from which ORBAAN, *op. cit.*, pp. 12-13, has printed the dedicatory preface to the bishop of Utrecht. This had already been published by MAURICE DE WULF, « HENRI BATE de Malines, » *Bulletin de l'Académie royale de Belgique, Classe des lettres*, 1909, pp. 465-81, but I believe from another manuscript at Brussels.

(17) Ottob. 1552, fols. 83r-87v, *Hermeti Flores extracti de libro de speculis et luce*.

(18) *Ibid.*, fols. 99v-101v.

(19) Vatic. 5733, fol. 187, *Hermes de quindecim stellis etc.*; Vatic. 4087, fol. 84, with additions by Arnald of Villanova.

(20) Palat. 1375.

(21) Palat. 1354.

(22) Palat. 1335, *IACOBI secreta secundum HERMETEM*.

Latin translation which exist at the Vatican might be of some service in tracing the origin and textual history of that work which deals also with the marvelous habits and properties of animals, supposed to have been translated into Greek by a PHILIP from the Egyptian. But one, at least, of the Vatican copies is of the seventeenth century (23).

46) A Barberini manuscript contains an astrological discussion of critical days by the Dominican, HUGO DE CIVITATE CASTELLIS (24). QUETIF and ECHARD were aware only of his commentary on the *Sphere* of SACROBOSCO, begun at Paris and completed at Florence in 1337, of which a copy was preserved at the time when they wrote in the Dominican convent of St. Honorarius at Paris. HUGO was otherwise unknown to them. (25) But our manuscript calls him bishop as well as friar and states that his treatise on critical days was written at Perugia in 1358, thus considerably extending our knowledge of his date and career. I fail to find his name, however, in lists of medieval bishops or in literary histories of Perugia such as that of VERMIGLIOLI.

47) In a sixteenth-century manuscript is a work on medicinal herbs of the Indies which « an Indian physician of the College of Holy Cross composed, taught by no reasons but by experience only, » in the year 1552. (26) There is a dedication by MARTIN DE LA CRUZ to FRANCISCO DE MENDOZA, and the work closes with a letter of JOHN BADIANUS, the Latin translator, to the reader.

48) The Latin translation of a work on plants ascribed to GALEN is attributed in Vatic. 4422 to JACOBUS ALBENSIS, (27) a

(23) Vatic. 3898, HORI APOLLINIS Hieroglyphica, « Seculum signere... »; Vatic. 6887, 17th century, fols. 1-24, HORI APOLLONIS Niliaci Hieroglyphica quae in lingua aegyptia edidit ipse, in graecam vero PHILIPPUS vertit, « Aevum vel aeternitatem... »

(24) Barb. 178, 14th century membr., fols. 105-6, « Incipit tractatus de diebus criticis secundum astrologos editus Perusii anno Christi 1358 per venerabilem virum dominum fratrem HUGONEM DE CIVITATE CASTELLIS ord. praed. et episcopum mire in astrologia peritum. » « Sicut dicit commentator... / ... et vocatur similitudo. »

(25) QUETIF et ECHARD, *Scriptores ordinis praedicatorum*, 1719, Vol. I, p. 593b.

(26) Barb. 241, paper, 63 fols., Libellus de medicinalibus Indorum herbis quem quidam Indus Collegii Sanctae Crucis medicus composuit, nullis rationibus doctus sed solis experimentis edoctus anno Domini Servatoris 1552.

(27) Vatic. 4422, fols. 1-6, GALENUS de plantis IACOBO ALBENSI interprete, « Prima earum inquit GALENUS... » In Vatic. 4864 we saw ALBERTUS MAGNUS represented as commenting on GALEN on plants.

personage otherwise unknown to me and whom I have not seen mentioned elsewhere as a translator into Latin. He does not appear to be identifiable with the JACOBUS ALEXANDRINUS or the JACOBUS HENRICUS de Alba listed by FABRICIUS. The common medieval work on plants was usually ascribed to ARISTOTLE rather than to GALEN. It was a brief treatise, really by NICOLAUS DAMASCENUS, which ALFRED OF ENGLAND or SARSHEL translated from Arabic into Latin in two short books and which ALBERTUS MAGNUS expanded into the seven long books of his *De vegetabilibus et plantis*. STEINSCHNEIDER, however, identified the *De plantis* ascribed to GALEN with a *De medicinis occultis* which was translated from the Arabic by ABRAHAM TORTUOSIENSIS and GRUMERUS, a judge of Piacenza. (28) The work was included in some of the earlier editions of GALEN's works and was described by KÜHN (29) as a synopsis of the books of GALEN *De simplicium medicamentorum facultatibus* made by some Arabic physician and enriched by the commentaries of HUNAIN IBN ISHAK. (30)

49) Vatic. 5698 contains the Latin translation of PTOLEMY's *Geography* by JACOBUS ANGELUS who in 1393 returned with CHRYSOLORAS from Italy to Constantinople in order to learn Greek and search for manuscripts. In 1409 he translated the *Geography* for Pope ALEXANDER V. Can the Vatican manuscript be the autograph?

50) In 1505 a « Question of the subtle doctor, JOHN DE CASALI, on the velocity of the motion of alreration (31), » was printed at Venice with the *De modalibus Bassani Politi* etc. The same brief work is found in a Vatican manuscript (32) and in a Riccardian manuscript at Florence which dates it of 1346. JOHN DE CASALI was a doctor of theology and native of Montferrat. In 1375 GREGORY XI made him his nuncio to FREDERICK, king of Sicily.

51) A copy of the *Liber secretarius practice* of master JOHN

(28) « Die europäischen Uebersetzungen aus dem Arabischen, » *Vienna Sitzungsberichte, Philos.-Hist. Klasse*, Vol. 149, 1905, pp. 2, 32.

(29) *Claudii Galeni Opera Omnia*, I, clxxi.

(30) For some further account of the work's content see my *History of Magic and Experimental Science*, Vol. II, pp. 763-4.

(31) Incipit, « Utrum in mobilibus ad qualitatem id semper velocius moveatur quod in equali tempore acquirit maiorem latitudinem qualitatis... » Explicit. « Ad hoc respondeo concedo conclusiones omnes istas tamquam possibiles. »

(32) Vatic. 3026, fols. 29-33.

JAMES, chancellor of the University of Montpellier, occurs in Palat. 1240, fols, 41r-73r (33). It deals in six books and numerous tractates with the diseases of various parts of the body. TIRAQUEAU in the long alphabetical list of medical men in the thirty-first chapter of his *De nobilitate* (Venice, 1574) seems to allude to this work as the *Thesaurarius* rather than *Secretarius* (34). JOHN JAMES is also known for his pest tract. BARBOT lists five manuscripts of it from other libraries (35) but fails to note two at the Vatican, Palat. 1210 and 1229, IOANNIS IACOBI de pestilentia. JOHN JAMES may well be the Chancellor whose *Experiments* have been already mentioned, but BARBOT notes no such work by him. He was physician to some of the popes at Avignon and wrote the *Liber secretarius* at the request of CHARLES V of France in 1370. His secret appointment as chancellor was contested by the faculty in 1364; he died in 1384 (36).

52) Vatic., 2225 fols. 11r-37v, is a manuscript of the *De proportionem motuum in velocitate* of JOHN MARLIANUS of Milan (died 1483), the physicist and mathematician and professor of astrology and philosophy at Pavia. This manuscript was not known to ARGELLATI in his account of JOHN (37). The work was printed in 1482. MARLIANUS dedicates his work to BENEDICTUS REGUARDATUS, the physician of SFORZA, whom we have already mentioned. In another manuscript (38) is a pest tractate composed by a JOHN DE MERLIANO, doctor of arts and medicine, who was

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(33) BARBOT, in his account of «Les œuvres de JEAN JAUME» in the work mentioned in a following note, gives the title as *Secretarium* and lists only two MSS of it, both from Paris, BN 6957 and 6988A, and both already noted by PANSIER, «Les maîtres de la faculté de médecine de Montpellier au moyen âge,» *Janus*, 9, 1904, pp. 600-2. PANSIER was scarcely correct in calling the work of JOHN JAMES «assez bref»; he seems to have misinterpreted the author's description of it as «unam summam brevem.» It is short for a *Summa* but not for a treatise.

(34) «IOANNES IACOBUS Montispessulani Cancellarius cuius Thesaurarium medicinae habemus in quo tractat de morbis particularibus.»

(35) ANDRÉ BARBOT, *Traité de la peste composé en 1376 par Jean Jaume*, Dissertation, Montpellier, 1923, 39 pp., Latin text with French translation.

(36) For further details of his life see BARBOT, *op. cit.*, pp. 9-12, or PANSIER, *Janus*, 9, 1904, pp. 600-2.

(37) P. ARGELLATI, *Bibliotheca scriptorum Mediolanensium*, Milan, 1745, II, 866-868.

(38) Barberini 186, 15th century, fols. 49v-52. I have not examined the manuscript. From its closing note quoted presently in the text it might be inferred that this pest tract was an incunabulum bound into the manuscript, but from its foliation beginning at 49 *verso* one would infer not.



moved by the terror which the plague excited in Venice. It would hardly seem that he can be the same person as JOHN MARLIANUS. A note appended to the manuscript informs us that this pest tract was printed at Venice in 1478 and « now at Rome in 1482, » but the work is unnoted in KLEBS' bibliographical list of incunabula on the plague (39) and in other catalogues of incunabula.

(53) In 1397 JOHN MOLINERII wrote a work on weak sight, *De visus debilitate*, Reg. Suev. 1847, fols. 128r-135v. It is apparently addressed to a pope or cardinal (40) and is signed « your humble servant JOHN MOLINERII, physician to our lord the king, » — whether of France or not is not stated. The work does not seem to have been printed. In PANSIER's list of masters of the medical faculty of Montpellier in the fourteenth century (41) a GUILLELMUS MOLINERII appears in 1378 as a procurator, but no JOHN MOLINERII is mentioned.

(54) In Vatic. 4422, which we have already noticed as containing two collections of medical experiments, there further occurs « a brief compilation or booklet of medicines, simple and compound. (42) » It is attributed to JOHN DE PALMA, which may possibly be a slip for Parma. AFFÒ long since listed manuscripts by JOHN OF PARMA at the Vatican and elsewhere (43), and there was a JOHN OF PARMA in medicine both at Bologna about 1300 and at Avignon at the time of the Black Death. But a JOANNES DE PALMA in medicine is unfamiliar. (44).

(55) Of the following items ascribed vaguely to JORDANUS in the long-hand catalogue of the Palatine collection, the *De ponderibus* may be presumed to be the familiar work of JORDANUS NEMORARIUS but the catalogue's indications are too brief to pass on the others without examining the manuscripts themselves: Palat. 1173,

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(39) A. C. KLEBS et E. DROZ, *Remèdes contre la peste : fac-similés, notes et liste bibliographique des incunables sur la peste*, Paris, 1925.

(40) It opens, « In nomine sancte crucis et summi pontificis a quo omnes cause producantur... » and closes, « ... ad vestre paternitatis reverentiam... »

(41) *Janus*, 9, 1904, p. 596.

(42) Vatic. 4422, fols. 85-87, JOANNIS DE PALMA compilatio brevis seu libellus de medicinis simplicibus et compositis; opening, « Quoniam quidam... »

(43) Padre IRENEO AFFO, *Memorie degli scrittori e letterati Parmigiani*, 1789-1833 Vol. II, pp. 47-48. »

(44) Under that name CHEVALIER has merely a cross reference to JEAN DE BAUME, Dominican and Inquisitor from 1316 to 1333.

*Experimenta*; 1212, *Astronomica*; 1377, *De ponderibus*; 1380, *De coelis*. An arithmetic in three parts is ascribed to a JORDANUS DE DATIS in Ottob. 2120; that of JORDANUS NEMORARIUS has ten divisions. In Ottob. 309 JORDANUS NEMORARIUS is credited with two arithmetical works: at fol. 114, *tractatus duo de numeris et de minutiis*; at fol. 120, *elementa arithmetice*.

56) To JORDANES DI TURRE (GIORDANO DELLA TORRE?) is ascribed a work on finding the degrees of simple or compound medicines. It is addressed to his son JOHN (45). JORDAN appears to write at Montpellier, since he refers to ARNALD OF VILLANOVA and BERNARD GORDON as his predecessors and to his son's associates in that venerable *Studium*. The work is dated 1325 both in the top margin and the Explicit. PANSIER has noted from the Montpellier records that JORDANUS DE TURRE was professor in 1313, again appears in 1320, and is cited by GUY DE CHAULIAC and VALESCUS DE TARANTO writing later in the century (46). PANSIER thought that the mention in 1335 among the professors at Montpellier of a JOHANNES DE TURRE was a slip for JORDANUS, but would not this be the son JOHN of our manuscript to whose associates in the university his father refers? Of works by JORDANUS DE TURRE PANSIER mentioned two: in BN 7066, « de mulierum impregnatione »; and in the same library, nouveau fond latin 1391, « Tractatus mutilatus JORDANI DE TURRE in quo ponuntur remedia multarum egritudinum ». The Vatican manuscript would appear a different work from either of these.

57) The Vatican contains a copy which seems not hitherto to have been noted of the Algebra of AL-KHOWARIZMI in Latin translation (47). It is not ROBERT OF CHESTER's translation as edited by KARPINSKI (48) but rather the form of translation published by LIBRI from two Paris manuscripts (49). This version is probably

(45) Vatic. 2225, fols. 53r, col. 1, — 66v, col. 2: JORDANIS DI TURRE de adinventionione graduum in medicinis simplicibus et compositis, opening, « Salvet te Deus, fili mi IOHANNES, in veritate te dirigat... »

(46) P. PANSIER, « Les maîtres de la faculté de médecine de Montpellier au moyen âge, » *Janus*, 10, 1905, 3.

(47) Vatic. 5733, fols. 275r-87r. The MS includes works of POMPONAZZI as well as thirteenth century authors, and so is presumably late.

(48) L. C. KARPINSKI, *Robert of Chester's Latin Translation of the Algebra of Al-Khowarizmi*, 1915.

(49) GUILLAUME LIBRI, *Histoire des sciences mathématiques en Italie*, Halle, 1865,

that by GERARD OF CREMONA, but in our Vatican manuscript SIMON OF CREMONA is said to have translated the work at Toledo from Arabic into Latin. BONCOMPAGNI published a still different version (50), which is represented as GERARD's translation, from another Vatican manuscript. (51)

58) In discussing the work of ROBERT KILWARDBY, archbishop of Canterbury from 1272 to 1279, on the origin and divisions of science or philosophy, BAUR mentioned one anonymous manuscript of it at the Vatican — Vatic. 5328 (52). There is yet another — Vatic. 9414, 15th century, fols. 1-64r.

59) Professor HASKINS has listed three Vatican manuscripts of the twelfth century translation from the Greek of the work usually known as KIRANIDES (53). He does not mention Vatic. 7610, but it is of the seventeenth century and doubtless hardly worth mentioning. One other manuscript professes to give the Harpocraton of Alexandria from whom the Latin *Kiranides* is partially derived (54). Another is the Latin version, perhaps translated from the Arabic instead of the Greek, under the name

Vol. I, Note XII, pp. 263-97. Vatic. 5733 has the same Incipit, « Hic post laudem dei et ipsius exaltationem inquit : Postquam illud quod ad computationem esset necessarium consideravi repier totum illud numerum fore... » It closes at p. 286 of LIBRI's text, « ... est numerus hominum primorum qui sunt duo homines. » To this corresponds at p. 120 of KARPINSKI's text, « ... numerum puellarum primorum designabit, et ipsae sunt duae. »

(50) *Atti dell'Accademia Pontificia de'Nuovi Lincei*, Tomo IV, Anno IV (1850-1851), Roma, 1852, pp. 387-493, « Della vita e delle opere di GHERARDO CREMONESE, traduttore del secolo duodecimo, e di GHERARDO DA SABIONETTA astronomo del secolo decimoterzo. Notizie raccolte da BALDASSARE BONCOMPAGNI. » The text is printed at pp. 412-35.

(51) Vatic. 4606, fols. 72r-76v, « Incipit liber qui secundum Arabes vocatur algebra et almucabala, et apud nos liber restauracionis nominatur, et fuit translatus a magistro GIURARDO CREMONENSE in toleto de arabico in latinum. Unitas est principium numeri et non est numerus... »

(52) LUDWIG BAUR, *Dominicus Gundissalinus de divisione philosophiae*, Münster, 1903, Vol. IV of *Beiträge zur Geschichte der Philosophie des Mittelalters*, Heft 2-3, pp. 368-75.

(53) C. H. HASKINS, *Studies in the History of Mediaeval Science*, 1924, p. 219, note 152. I think that the number of the Vatic. Palat. lat. MS is 1279 rather than 1273, as there stated.

(54) Palat. Graec. 226, 15th century, fol. 194, Ex Harpocratone Alexandrino de animalium plantarum et lapidam vitutibus physicis selecta ordine litterarum digesta. I have not seen the manuscript to make sure whether the text is in Greek or in Latin.

*Alchiranus* (55), of which I listed a Venetian manuscript in my *History of Magic and Experimental Science* (56). The Vatican manuscript is, like the Venetian, of the sixteenth century, and both may be late fabrications. The brief works of ALEXIUS AFRICANUS and TESELAUS on seven and twelve herbs respectively, which are apparently closely associated with the Kiranides, also occur in Vatican manuscripts (57).

60) Of the surgical work of LEONARD OF BERTIPAGLIA in the early fifteenth century, between whose manuscript and printed texts there are important divergences, which I discussed in 1926 on the basis of the two manuscripts of the treatise then known to me (58), there is a third manuscript at the Vatican (59).

61) In Vatic. 6867 *Astrologia Leonardi a Qualea* has the same Incipit, « Lux naturae deus... » as the *Astronomia medicinalis* of LEONARDUS QUALEA, concerning whom Dr. SARTON made inquiry in *Isis*, 6, 1924, pp. 523-4, and I replied in *Isis*, 8, 1926, pp. 336-8. The only manuscript previously mentioned of QUALEA's work was BN 10, 624 at Paris. Since the Vatican manuscript is of the seventeenth century, it is presumably of little value and may be merely a copy of this Parisian manuscript.

62) To MAGORINUS, whoever he may have been, a theory and practice of medicine, a work on artificial waters, and a rule of health are ascribed in as many manuscripts by the long-hand catalogue of the Palatine collection (60). He would hardly be the same as the MAGROBONUS whose geometry was translated into Italian by GIOVANNI DEI DONTI about 1370 (61).

(55) Vatic. 9952, fols. 131-232, Liber Alchiranni de proprietatibus rerum. Liber phisicalium virtutum compassionum et rationum... deinde de lapidibus exequemur, amen.

(56) Vol. II, p. 232 : citing S. Marco XIV, 37 (Valentinelli), fols. 11-73.

(57) Vatic. 6267, fol. 48, Tractatus de septem herbis planetarum, « ALEXIUS AFRI... »; Palat. 1234, ALEXII AFRICANI de septem herbis et septem planetis; Palat. 1278, TESELAUS Philosophi Herbarium. In the last named manuscript we also have ALQUASIQUI de herbis.

(58) « The manuscript text of the *Cirurgia* of LEONARD OF BERTIPAGLIA, » *Isis*, 8, 1926, pp. 264-84.

(59) Reg. Suev. 1969; and a fourth manuscript at Venice, S. Marco L.VII.LI (Valentinelli, XIV, 28). A fifth manuscript is Wolfenbüttel 4007.

(60) Palat. 1213, MAGORINI Theorica et practica medicinalis; 1229, de aquis artificialibus; 1332, de regimine sanitatis.

(61) STEINSCHNEIDER, «Die europäischen Uebersetzungen aus dem Arabischen,» Vienna *Sitzungsberichte, Philos.-Hist. Klasse*, Vol. 149, 1905, p. 40.

63) Of the *Liber ignium* of MARCUS GRECUS, important in the history of chemistry, which BERTHELOT edited from two Paris and two Munich manuscripts (62), there are at least two more manuscripts at the Vatican (63). In this connection may be mentioned an anonymous work on fire, its nature, action, and effects, in a third Vatican manuscript. (64)

64) Brother MATTHAEUS DE AQUILA, of the Order of Celestines and professor of theology, wrote under CALIXTUS III (1455-58) on the causes and nature of comet and earthquake. A copy of his treatise is preserved in a Barberini manuscript (65). The occasion of his work was no doubt the two destructive earthquakes in 1456 which also led JANNOTTI MANETTI to address three books on the subject to ALPHONSE OF ARAGON in 1458 which I have just been reading in a Paris manuscript, BN 6746.

65) The Vatican contains a manuscript of MICHAEL SCOT's *Abbreviatio Avicenne libri animalium*, of which HENRY OF COLOGNE was permitted by the emperor FREDERICK II to make this copy at Messina in 1232, (66) and another manuscript comprising MICHAEL's *Liber particularis* and *Liber physionomie* (67).

(62) BERTHELOT, *La chimie au moyen âge*, 1893, Vol. I, pp. 89-135. I mentioned some other MSS of it in my *History of Magic and Experimental Science*, 1923, Vol. II, p. 786.

(63) Vatic. 5377, fol. 127, MARCUS GRECUS, *Liber ignium*; Palat. 1176, MARCI GRECI de igne artificiali.

(64) Ottob. 1870, fols. 158r-65r. The title, which seems to have been written in by a later hand, reads, « De igne, ignisque natura, ac de multis que per ignem efficiuntur. » The treatise opens, « (S) tatus et collossis faciundis quales fecere veteres ex ere... »

(65) Barb. 268, 15th century, 33 fols., De causis atque natura comete et terremoto, opening, « Sepe metum post illum tremendum et periculo plenum motum terre... » and closing, « ... presidentique universali ecclesie Sancto domino Nostro CALISTO TERTIO. »

(66) Barberini lat. 305, 13th century, membr., 49 fols, « FREDERICE, Romanorum imperator, domine mundi, suscipe devoto hunc laborem MICHAELIS SCOTI ut sit gratia capiti tuo et torques collo tuo. Ut animalium quidam... / ... iam scis ex alio loco. Completus est liber AVICENNE de animalibus scriptus per Magistrum HENRICUM COLONIENSEM ad exemplar magnifici in primis domini FREDERICI apud Messiam (*sic*) civitatem Apulie ubi dictus Imperator eidem magistro hunc librum promissum commodavit anno Domini MCCXXXII in vigilia beati Laurentii. »

(67) Rossi. 421 (formerly IX, 111 and 1182), fols. 1-48 *Astrologie lib. II particularis*; fols. 49-72, *Liber physionomie*. This MS is noted under its old number by HASKINS, *Studies in Medieval Science*, 1924, p. 291; he further cites *Neues Archiv*, Vol. XXX, p. 353 *et seq.*

66) IOANNES BAPTISTA MONTANUS, or GIOVANNI BATTISTA MONTANO, a physician of Verona, was a prolific medical commentator and author of the first part of the sixteenth century. His *De methodo medendi* was already during his lifetime coupled with that of GALEN by other writers (68). An Ottobonian manuscript contains a grouping of his treatises (69) which does not seem to correspond to any of the numerous editions of his works listed in the British Museum printed catalogue.

67) Although the huge medical compilation of NICCOLÒ FALCUCCI of Florence, who died in 1411 or 1412, is available in the printed edition of 1484 in several enormous volumes and in subsequent editions, it may be worth while noting that it is contained in four successive manuscripts of the Vatican (70). A *De febris pestilentiali ac de venenis* is attributed to NICCOLÒ FALCUCCI in Ottob. 3030, but I cannot say whether it is an extract from his aforesaid omnium gatherum, whose second *Sermo* is devoted to fevers but whose discussion of poisons I do not recall.

68) In Vatic. 3897, fols. 77r-86r is a very interesting discussion of the question whether Platonic ideas concur in the generation of natural things by NICCOLÒ DA FOLIGNO, in the form of a letter of 1470 to his *compater* NICCOLÒ, which I propose to compare with the similar work of NICCOLÒ DA FOLIGNO to LORENZO DE' MEDICI in a manuscript at Florence (71), and to print both texts in a forthcoming volume on *Science and Thought in the Fifteenth Century*.

69) In the Vatican are two unpublished works by NICOLAS ORESME which I believe to be identical with two described from manuscripts in the Bibliothèque Nationale at Paris by CHARLES JOURDAIN in his article on ORESME and the astrologers of the

(68) *J. Caii... de medendi methodo libri duo ex Cl. Galeni...* et J. B. M. *sententia*, 1544; J. CRATO, *Methodus Therapeutica ex sententia Galeni* et J. B. M., 1555.

(69) Ottobon. 1180, fol. 1, de componendis medicamentis; fol. 51, de investigatione simplicium medicamentorum; fol. 87, de medendi methodo; fol. 127, Consilium. This last item has possibly not been printed.

(70) Vatic. 2442, 2443, 2444, and 2445, *Sermones septem de conservatione sanitatis*. In the catalogue the author is referred to simply as NICOLAUS FLORENTINUS, which does not serve to distinguish him from NICCOLO NICCOLI, the friend of POGGIO.

(71) Laurent. Plut. 82, cod. 22. I have already treated of it somewhat in an article on « Some Unpublished Renaissance Moralists and Philosophers of the Second Half of the Fifteenth Century, » in *The Romanic Review*, XVIII (1927), 114-133.

court of CHARLES V (72), although in the Vatican manuscripts they have different titles. But the *Tractatus in quo redarguitur ars magica* (73) has the same Incipit (74) as the treatise described by JOURDAIN under the title, *Contra judiciarios astronomos*. A treatise by ORESME in Vatic. 4082, fols. 97v-108, is incorrectly catalogued as *De incommensurabilitate motuum coelestium* and as opening « Cum ZENONEM et CRISPUM... » An examination of the codex itself reveals that the work opens, « ZENOMEN et CRISPUM maiora egisse affirmat SENECA... » and that its author states in the preface, « hunc libellum edidi de commensurabilitate motuum celi. » (75) Presumably it is identical with ORESME, *De commensurabilitate motuum celestium* in a manuscript now at Florence (76) and with JOURDAIN's *De proportionalitate motuum coelestium*. I am now engaged in a more detailed study of the work.

70) Of the work on dreams, or *Liber thesauri occulti*, which I described on the basis of an anonymous manuscript at Paris (77) and which Professor HASKINS identified from a DIGBY manuscript at Oxford (78) as the work of PASCHAL THE ROMAN, produced at Constantinople in 1165 (79), there is yet another manuscript at the Vatican (80) but it is incomplete, like Harleian manuscript 4025 of the British Museum mentioned by HASKINS.

71) Several manuscripts at the Vatican attest the penchant of pope PAUL III (1534-1549) for astrology (81).

(72) In his *Excursions historiques et philosophiques à travers le moyen âge*, 1888 pp. 561-585.

(73) Vatic. 4275, fols. 35-40r.

(74) « Multi principes... », alluding to the devotion of many princes to astrology.

(75) However, its second book considers the possibility of their being incommensurable.

(76) Ashburnham 210 (old number 142), fols. 159r-171v.

(77) BN 16610, fols. 2r-24r : see my *History of Magic and Experimental Science*, II, 297-300.

(78) DIGBY 103, fols. 41-58v.

(79) C. H. HASKINS, *Studies in Medieval Science*, 1924, p. 218.

(80) Ottobon. 1870, fols. 97r-102r, Rubric, « Liber thesauri occulti a PASCHALI ROMANO editus Constantinopoli » but without giving the date. The Incipit is as printed by HASKINS from the DIGBY manuscript.

(81) Vatic. 3687, VINCENTII FRANCISCUCII ABSTEMII de laudibus astrologie ad PAULUM III, opening, « Magna diu questio... »; 3689, MARTII ALTERII genitura HORATII FARNESII CASTRI DUCIS ad PAULUM III; 3690, MARTII ALTERII de revolutione anni octogesimi primi etatis PAULI III; 3691, MARTII ALTERII genitura ALEXANDRI FARNESII OCTAVII DUCIS filii; 7180, fols. 366-375, Vaticinia IOANNIS DE ANGUILERA beatissimo pontifici PAULO III inscripta.

72) Since Vatic. 3684 appears to be the only known manuscript of PAUL OF MIDDELBURG's (1445-1533) *Exhortatio pro calendarii emendatione ad Innocentium VIII*, written in 1491, it may be well to mention it, although it has already been included in the list of PAUL's writings given by D. J. STRUIK in his article, « De Geschriften van PAULUS VAN MIDDELBURG, » in the publications of the Dutch Historical Institute at Rome (82).

(73) The subject of Optics or Perspective, to which ROGER BACON devoted the fifth section of the *Opus maius*, is treated in a number of manuscripts, of which the further study might prove profitable. BACON's own treatment is found in Palat. 828, Vatic. 2975 and 3102, as Mr. A. G. LITTLE has already noted in his bibliography of BACON's writings. Another copy of it is found in Barberini 350, 14th century membrane, fols. 2-17, as the opening and closing words of the text make evident, although no author is named. In Barberini 357 is the Perspective of BLASIIUS of PARMA, whose contents I have described elsewhere (83). The Incipit of an anonymous perspective in Vatic. 4082, fols. 11-21v, (84) « Inter phisice considerationis studia lux iocundius afficitur... » serves to identify it with the work of JOHN PECKHAM. Other anonymous treatises which on closer examination could perhaps be identified with works of known authorship are : Vatic. 3102, fol. 55, « In planis speculis... »; Vatic. 5963; Palat. 1369, *Prospectiva et signa coelestia*; Ottob. 1850, fol. 8, Anon. *de speculis comburendis*.

74) Vatican manuscripts were not used by SUDHOFF in his series of nineteen articles in the *Archiv für Geschichte der Medizin* on pest tractates written during the century and a half following the Black Death (85). There are, however, at the Vatican both

(82) *Mededeelingen van het Nederlandsch Historisch Instituut te Rome*, Vol. V, 1925, pp. 79-118. Also described by ORBAAN, *Bescheiden in Italie*, 1911, p. 18, No. 28. ORBAAN, *Ibid.*, 198-9, describes PAUL's *De correctione kalendarii*, addressed to LEO X, as found in Ottob. 370.

(83) *Archeion*, Vol. IX, 1928, pp. 187-8.

(84) I have examined the text which has fairly frequent headings in larger writing scattered through it. The text terminates, « ... auctor libri de speculis non intellexit credo quod erravit. Si quem vero prolixior delectet demonstratio, sextum consideret perspective. »

(85) KARL SUDHOFF, « Pestschriften aus den ersten 150 Jahren nach der Epidemie des « schwarzen Todes » 1348, » The concluding article, in the volume of the *Archiv* for 1925, pp. 241-91, gives indices of authors, titles, Incipits, and manuscripts.



a number of manuscripts containing treatises which he lists from other sources, and also some treatises which he does not mention. Of these I am treating in a separate note to the *Archiv für Geschichte der Medizin*.

75) A goodly number of manuscripts at the Vatican contain works by PETER OF ABANO, the celebrated writer on medicine, astronomy, and philosophy of the late thirteenth and early fourteenth centuries, but most of these have already been listed by SANTE FERRARI in a supplement to his earlier study on PETER (86). He seems, however, to have overlooked the manuscripts of the Barberini collection, where we find a copy of PETER's *Physionomia* (87), of his treatise on the motion of the eight sphere (88), of his work on poisons (89), and of his completion of the translation of the fourteenth book of GALEN's *Therapeutic Method*, left unfinished by BURGUNDIO OF PISA (90).

76) Since we have mentioned PETER's work on poisons, it may be noted that the catalogue gives no author for a treatise on poisons in Vatic. 6863, but dates the codex as of the fifteenth century. We have already referred to the work on poisons of ANTONIO GUAINERI and shall later mention that of WILLIAM DE MARRA.

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(86) SANTE FERRARI, «Per la biografia e per gli scritti di PIETRO d'ABANO,» *Atti della R. Accademia dei Lincei*, Anno CCCXII, 1915, Serie quinta, *Memorie della classe di scienze morali, storiche e filologiche*, Vol. XV, Rome, 1915, pp. 629-727. While 1915 is the date on the title page of the volume, FERRARI's preface is dated December, 1917, and the separate cover for his particular fascicule, Fasc. vii, is dated 1918. It was perhaps not actually printed even then, because of wartime conditions, and seems to have been received at the Columbia University library only on Dec. 15, 1922, although some earlier fascicules in the same volume, dated 1915 and 1916, were received on March 19, 1918.

(87) Barb. 341 (X, 159), 15th century, 26 fols. «Incipit liber compilationis physionomie a Magistro PETRO DE PADUA in civitate Parisiensi, cuius tres sunt particule... / ... hoc bonum optimum quoque creavit.»

(88) Barb. 256, 15th century chart., fols. 103-14v, «Quoniam iuxta PTHOLOMEUM... / ... et diversitas inde causata existent.»

(89) Barb. 332, 14th century, fols. 326-37. It is unusual in that the pope to whom it is addressed is called INNOCENT: «Reverendissimo in Christo Patre et domino Innocentio divina Providentia summo Pontifice...» However, at Venice an Italian translation of the work in MS S. Marco XI, 82 (Valentinelli), is also addressed to INNOCENT.

(90) Barb. 178, 14th century membr., fols. 3-44v, «Expletus est liber tarapeutice cum additionibus Magistri PETRI DE EBANO que deficiunt ex translatione BURGUNDIONIS civis Pisani. Deo gratias anno domini MCCCXXVIII die VIa Maii.»

77) JOHN HOLYWOOD or SACROBOSCO, of whose life we know little at first hand, has been known chiefly through his astronomical and mathematical works of an elementary character, an *Algorismus*, an ecclesiastical *Computus*, and the much used *Sphere*. There is also said to be a treatise on the astrolabe by him in a manuscript at the Bodleian, but I cannot give its shelf mark. But the catalogue of the Ottobonian collection at the Vatican represents more advanced works as attributed to him in its manuscripts: commentaries on ARISTOTLE's four books *De coelo* (91) and on his *De generatione et corruptione* (92), and a third work on measuring altitudes, latitudes and depths by various instruments and mathematical practices. (93) I did not have time to inspect the manuscripts in question to determine how far they supported these attributions.

78) SANCTA SOPHIA was the name of a famous family of physicians, professors of medicine, and medical writers in Italy of the later middle ages. Some of the works of GALEAZZO OF SANCTA SOPHIA, who died of the plague in 1427, have been printed, but not, so far as I can find, the *Simplicia Galeatii*, contained in a Vatican manuscript of 1462 A. D. (94)

79) In Vatic. lat. 2225, a manuscript which we have had occasion to mention in other connections in this article, the opening treatise is by a SIMON GEMINIUS of Perugia on quantitative virtue. SIMON writes from his house in Perugia on April 16, 1470, and addresses a prologue to NICCOLÒ OF TIVOLI (95).

80) This same manuscript contains treatises by SIGISMUNDUS DE POLCASTRIS (96) which were printed at Venice in 1506 (97), but one of them gives the date of its composition in 1444, the *Questio de actuacione medicinarum ad Laurentium Roverellum*.

(91) In both Ottobon. 3024 and 3290.

(92) Also contained in both the above mentioned manuscripts.

(93) Ottobon. 3290, de modo mensurandi altitudines latitudines profunditates per varia instrumenta et praxes mathematicas.

(94) Vatic. 1279, fols. 1-120.

(95) Vatic. 2225, fols. 11-8v, SIMONIS GEMINII de Perusia Tractatus de virtute quantitativa. The prologue opens: « Sepe ac multum... » The text begins, « An quantitas... » The whole ends, « ... Bene vale NICOLAE sapi. dulcissime. Perusie ex nostris domibus 16 kalendas maias 1470. »

(96) The *Questio de extremis temperantiae* occupies fols. 109-115r; the *Questio de actuacione medicinarum* occupies fols. 146-176r. Other medical tracts by him intervene.

(97) HAIN \*13291 notes a 1473 edition of his *Quaestio de restauratione humidi*.

This is confirmed by another manuscript of the same treatise at Venice (1), while a Bologna manuscript instructs us that MICHAEL SAVONAROLA in or before 1455 addressed his *Opus practicum* to SIGISMUND while the latter was lecturing on theory (2). This SIGISMUND lived to be ninety-four, taught over half a century at Padua (3), and, when all four of his sons died, remarried at seventy and had three more, of whom, says FABRICIUS, he lived to « adorn the second with the laurel in philosophy with hands tremulous from age. »

81) NIKOLAOS SOPHIANOS figures in LEGRAND's *Bibliographie hellénique* and KRUMBACHER's *Byzantinische Literaturgeschichte* as a Greek humanist of the first half of the sixteenth century and author of the first grammar of vulgar Greek. But in Vatic. 3686 is a Latin translation of a treatise by him on the astrolabe. As translator from the Greek is named ARNALDUS AIMERIUS (4).

82) Three medical works by STEPHANUS ARLANDI are found in as many Palatine manuscripts : 1225, *Experimenta*; 1331, *Dietarium*; 1234, *Viridarium super Antidotarium Nicolai*. The records of Montpellier mention a Master STEPHANUS ARLANDI as vice-chancellor in 1319. PANSIER regarded this as a slip of the pen for STEPHANUS ARNALDI, an author often cited by GUY DE CHAULIAC and VALESCUS DE TARANTA. GUY states that he treated JOHN XXII for eye trouble. MARINI further identified him with an ARNALDUS DE CATUSSIO of the diocese of Cahors who received a fee of forty

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(1) S. Marco XI, 17 (Valentinelli), 15th century, fols. 57-81, « Expleta et formata est questio de actuacione medicinarum... ad contemplationem dilectissimi LAURENTII ROVERELLI per SIGISMUNDUM DE POLCASTRIS patavum in studio paduano corrente anno Domini 1444. »

(2) Bologna A. 125, a 1455, 440 fols., with fols. 437-440 left blank, « Clarissimi domini MICHAELIS SAVONAROLE Patavinii equitis Hierosolimitani phisici sua tempestate excellentissimi ad d. SIGISMUNDUM POLCASTRUM patav(in)um theoricam legentem a capite usque ad pedes opus practicum feliciter incipit. Grave onus non minusque laboriosum... / ... et claudicant si non errantur. Explicit... et sic est finis ingeniosissimi operis... scripti et completi per me DANIELEM VERSAREN residentem in alma Universitate Studii ferrariensis anno domini 1455 die 28 may hora 16. »

(3) His name appears with great frequency in the academic records from 1412 to 1450, which is as far as they have been published : consult the Index of ZONTA et BROTTI, *Acta graduum academicorum gymnasii Patavini ab anno MCCCVI ad annum MCCCCL, Patavii*, 1922.

(4) Vatic. 3686, NICOLAI SOPHIANI de astrolabio ARNALDO AIMERIO interprete, opening, « Cum multis sane... »

florins from BENEDICT XII in 1340. PANSIER listed the titles of some seven works by STEPHANUS (5), but only one of our three treatises at the Vatican is among them, namely, the *Viridarium*. STEINSCHNEIDER, however, noted manuscripts of the *Dietarium* and of a translation by STEPHANUS of the *De sphaera solida* of COSTA BEN LUCA but did not mention our Palatine codices. Nor did he give STEPHEN's date but placed him as from Barcelona (6). Both STEINSCHNEIDER and CHEVALIER agree with PANSIER in regarding STEPHANUS ARNALDI as the more correct form of the name than ARLANDI, but I doubt it in view of the concurrent testimony of our Palatine manuscripts and the Montpellier records. Moreover, in a Wolfenbüttel manuscript the Latin translation of *De sphaera solida* is ascribed to STEPHANUS ARLANDI (7). In any case, none of the works to which we have referred appear to have been printed (8). The *Experimenta* may be the same as those of the Chancellor of Montpellier, since ARLANDI was vice-chancellor.

83) Two Vatican codices (9) may be added to the list of manuscripts of the *De natura rerum* of THOMAS OF CANTIMPRÉ in my *History of Magic and Experimental Science*, Vol. II, pp. 396-8.

84) Of JOHN TOLHOFF and his work on the movements of the heavens in two books addressed to Pope SIXTUS IV I have failed to find any mention, edition, or manuscript other than that at the Vatican (10). It includes astronomical tables, at the foot of each of which is a calculation for Rome, 1475. This was the year in which SIXTUS IV recalled REGIOMONTANUS to

(5) PANSIER, « Les maîtres de la faculté de médecine de Montpellier au moyen âge, » *Janus*, 10, 1905, pp. 9-10.

(6) STEINSCHNEIDER treated of him in *Serapeum*, Vol. XXI, 1870, p. 292; and in Vienna *Sitzungsberichte* etc. Vol. 149, 1905, pp. 77-8.

(7) Wolfenbüttel 2816, anno 1461, fols. 116-21, *Practica sphere solide translata a STEPHANO ARLANDI in latinum 1301*. According to STEINSCHNEIDER the manuscripts usually give 1303 as the date of translation.

(8) CHEVALIER's reference to COPINGER, 1902, II, ii, 645, is erroneous, and there is nothing by STEPHANUS ARLANDI or ETIENNE ARNAUD in the printed catalogues of the British Museum and Bibliothèque Nationale.

(9) Vatic. 822, where it is the fourth treatise in the MS; Vatic. 10064, 15th century, fols. 161-263.

(10) Vatic. 3103, fols. 11-32r, *Ad sanctissimum in christo patrem et dominum SIXTUM QUARTUM divina providentia sacrosancte Romane ac universalis ecclesie Pontificem maximum De motibus celestium mobilium IOHANNES TOLHOFF Artium Magister*. « Universitatis totius haut partem modicam... »

Rome to advise him concerning calendar reform, so that one wonders what relation there may have been between the work of JOHN TOLHOPF and of REGIOMONTANUS and PEURBACH. The latter's « new theory of the planets » was somewhat similar to that which TOLHOPF unfolds in his text and illustrates by a chart in colors which is folded into the manuscript. I shall treat more fully of TOLHOPF's work in my forthcoming book on *Science and Thought in the Fifteenth Century*.

85) In Reg. Suev. 1098, fols. 11-15v, is a treatise by GEORGE OF TREBIZOND (1395-1484), the Greek scholar who really came from Crete, on *antischia* (11) and why the predictions of astrologers often go wrong (12).

(86) Vatic. lat. 5377 is a manuscript full of marvelous waters, oils, secrets, and medical recipes for this and that complaint. At fol. 135r occurs the *Treatise of Marvelous Waters* ascribed to PETRUS HISPANUS (13), at fol. 137r a treatise of waters of master ALBERT OF ALAMANNIA, beginning with an *aqua vite* against hot and cold complaints, at fol. 146r a most precious electuary of Master GORDON which is presumably an extract from the medical writings of BERNARD GORDON, but most of the contents are anonymous. In a note I give some specimen headings (14).

87) WILLIAM BECCHIUS of Florence began his studies at the Augustinian convent in Padua in 1433, was made General of that Order in 1460, and bishop of Fiesole in 1470, from which position he resigned in 1481, dying later in extreme old age (15).

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(11) For this feature of astrological technique consult BOUCHÉ-LECLERCQ, *L'astrologie grecque*, 1899, pp. 161-64.

(12) « Liber de antischiis et cur astrologorum iudicia plerumque fallunt. »

(13) It is discussed on the basis of other MSS in my *History of Magic and Experimental Science*, Vol. II, pp. 500-501.

(14) Fol. 130r, De aquis mirabilibus cum suis proprietatibus. Et sequitur primo aqua pro oculis, Aqua potabilis sic fit; fol. 130v, Aqua yrundinum sic fit; fol. 131r, Aqua laxanda vel laxativa, Aqua dealbativa sic fit; fol. 131v, Aqua conservativa, Aqua duplicativa, Aqua salive; fol. 132r, Alia aqua pro oculis; fol. 132v, Aqua mirabilis et excellentissima ad spoliandum leprosos et lepram destruit omnem maculam oculorum delet et conservat oculum, Aqua pro oculis ad clarificandum; fol. 133r, Experimentum testissimum et approbatum contra tremorem membrorum, Aqua mirabilis contra debilitatem stomachi aut pro veneno aut pro epydinna...

Passing over some leaves, we come to : fol. 140r, de oleis, the last being, fol. 143v, Oleum de vitellis ovorum, Elixir vite; fol. 144v, Balneum marie sic fit. »

(15) GANDOLFO, *Diss. hist. de ducentis celeberrimis Augustinianis scriptoribus...* 1704, p. 147.

He wrote commentaries on ARISTOTLE's Ethics, Economics, and Politics. His work against Mohammedanism was printed in 1471. His treatise on the comet, addressed to COSIMO DE' MEDICI, is found in a Vatican manuscript, where it follows his discussion of the power of spirits (16).

88) Of the twelfth century work of WILLIAM OF CONCHES on natural philosophy there are some copies at the Vatican. I should need to examine Reg. Suev. 1222 to determine whether it is the original version under the title *De philosophia* or the revision addressed to the duke of Normandy and known as *Dragmaticon*, since the Incipit is missing, but Reg. Suev. 1021 and Palat. 1570 are clearly copies of the *Dragmaticon*.

89) The Vatican has at least two manuscripts of the work of WILLIAM OF ENGLAND, early in the thirteenth century, *On Urine Unseen*. In one case the catalogue erroneously ascribes the work to ANDALÒ DI NEGRO (17), but the Incipit, « Ne ignorantie vel invidie... » is in both cases that of WILLIAM's treatise (18).

90) To the interesting series of treatises on poisons addressed to popes by such physicians as PETER OF ABANO and ARMENGAUD BLASIUS may be added another by WILLIAM DE MARRA of Padua (19) who apparently wrote it for URBAN V (1362-70) (20).

91) In this closing paragraph I include some items which were overlooked until this article was complete and indexed, with some others which I have been unable to date or identify properly and had intended to omit but now include for the sake of greater completeness. Vatic. 901, fols. 136-43, GUIDO DE BONONIA

(16) Vatic. 4593, GULIELMI DE BOCHIS, fol. 1, de potestate spirituum, « Hora est iam nos de somno surgere... »; fols. 45-69r, de cometa, « Cum ad Sancti Marci bibliothecam pergerem... »

(17) Vatic. 4082, fols. 210-13.

(18) In Vatic. 5733, fols. 200-205r, the catalogue gives an unusual form of title, « Liber urinarum pro dispositione superiorum. » The text itself closes, « Explicit liber urinarum secundum magistrum GUILLELMUM astronomum. »

(19) Barberini 306. There are 157 pages — not leaves — of which 151-57 are occupied by a table of contents. « Incipit opusculum quod dicitur sertum papale de venenis. Exultent et letentur iam divina... »

(20) The pope does not seem to be named in the text, but on the preceding flyleaf we read, « FRANCESCO BARBERINO s. R. e. Cardinali Bibliothecario URBANI VIII Pont. Max. fratris filio Hunc librum de Venenis a GULIELMO DE MARRA Patavino URBANI V. p. m. medico compositum eidemque Pontifici dicatum ANDRONICUS SPINELLUS Patavinus eius ex fidei comm'sso heres atque Bibliothecae Vaticanae scriptor latinus. »

Questiones de gradibus formarum. Vatic. 2482, fol. 168, ANTONII MALGLANI DE' CHESIO de febribus in quinque partes divisus. Vatic. 3682, PANTALEONIS GUAIANI libellus de dentibus, opening, « Felices sunt beatissime pater... » Vatic. 4440, fol. 1, BARTHOLI SENENSIS Consilium pro PII SECUNDI dispositione, « Dispositio itaque naturalis... » Vatic. 6253, Magistri BONI liber computi de luna, « Compotus est... » Vatic. 8174 contains Scholia to astronomical tables for the years 1438, 1467, and 1470 composed by GABRIEL DE PIROVANO, and a translation from Castilian into Italian of the Libro di Astrologia of ALFONSO X made in 1341 by GUERUCCIUS (« GUERUCCII filio CIONIS FEDERIGHI civis Florentini »). Vatic. 8951, JOHANNES DE CALEMONTE Flandrinus, professor at Perugia 1467 A. D., ALFONSI regis tabule... cum additionibus. Barberini 343, fols. 60-64, Dialogus de salubritate aeris Romani, opening, « Questionum Tusculanarum liber primus... » Barberini 301, IO. BAPT. DONII de restituenda salubritate agri Romani, addressed to URBAN VIII. Barberini 350, fols. 61-65v, JOHANNIS FONTANA Venetus, De speculo, « Cum inferiorum cognitio ad coelestium conducat inquisitionem... » ; fols. 91-92, NICOLAUS ALAMANNUS pro equationibus duodecim domorum apud Florentiam. Ottobon. 31, fol. 117, RODIANI de lapide philosophorum sive opus triduanum. Ottob. 1289, DONNOLIS, (DE) FRANCISCI ALPHONSI Prolusio ad sue medicine cathedram quam in Patavina Accademia obtinuerat. Ottob. 1834, DETII (INCELOTI) Oratio de laudibus scientie in principio studii Papiensis. Ottob. 1545 and 1546, LEONARDUS PISANI Geometria. Ottob. 3307, LEONARDUS PISANI Arithmetica. Reg. Suev. 899, BONNET (HONORATI) doctoris Secretorum arbor bellarum ad CAROLUM VI regem Galliarum, in French, Reg. Suev. 1234, fol. 29, EMILII CAMPOLONGI nobilis Patavini de variolis. Reg. Suev. 1200, de lapide philosophorum seu opus mulierum et ludus puerorum. Palat. 1132, MATTHEI DE FERRARIA Expositio AVICENNE. Palat. 1222, GUIDO OF FORLI Opera varia medicinalia. Palat. 1215, PLATO DE DUISIS Herbarium. Palat. 1439, fols. 131-391, « Venerandissimo magistro patri ac domino domino IOHANNI archiepiscopo Strigonensi IOANNES GERMANUS DE REGIOMONTE... » Canons of Regiomontanus for the archbishop of Gran.

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LYNN THORNDIKE.

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Prospectus for a Corpus of Medieval Scientific Literature in Latin

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## Prospectus for a corpus of Medieval Scientific Literature in Latin

The nineteenth century witnessed the publication in various European countries of many great sets of writings and collections of historical sources which have proved of much value to historical scholarship and in the study of past life and thought. But especially since the war, with the economic depression of Europe and increasing costs of production, such undertakings have been noticeably upon the wane, and the few new projects which have been formed have often looked to America for financial assistance. Meanwhile the direction of historical inquiry had been rapidly altering, and new lines of interest were developing for which the essential materials have not yet been made available in printed form and critical editions. Especially is this true for the history of science and of medicine with respect to medieval writings in Latin. Too long have we been dependent for our knowledge of the middle ages upon collections made in the theological or ecclesiastical interest, like MIGNE's *Patrologia* or the *Acta Sanctorum*, or representing the standpoint of the national state and language, like the *Monumenta Germaniae historica* and *Histoire littéraire de la France*. A Corpus of scientific writings is a pressing desideratum. Such an undertaking would appropriately be based upon international cooperation, and only thus could it be assured success.

The present proposal is for a Corpus of medieval scientific writings in Latin. Those in the vernacular languages were usually either derived from Latin works or of minor importance, yet have hitherto been the more accessible. Medieval scientific writings in Arabic are of equal importance with those in Latin but probably can never be recovered in the same quantity. In any case they would properly constitute a distinct Corpus and

undertaking. Ignorance of the medieval contribution and background has long been a weak point of scientists and historians of science, although of late years a number of scholars have been hard at work endeavoring to remedy this defect. The present status of scientific, medical, and surgical works in medieval Latin may be briefly and roughly summarized thus. Many authors and treatises are undoubtedly at present quite unknown but will be turned up sooner or later in manuscript form. A second very large group are known, and some manuscripts of their works have been located and perhaps somewhat studied, but they have never been printed. A third group are in type as incunabula and other early editions which are almost equally rare and inaccessible, especially in America. Moreover, these early editions were often very carelessly printed from a single late and inferior manuscript of the treatise in question, or have taken unwarrantable liberties with the language and perverted the thought of the author. Merely to make them more accessible to readers by reproducing them in facsimile or otherwise, however pleasing it may be from an antiquarian standpoint, would not be at all satisfactory to students of the history of science or of the middle ages. Revised editions of such works must be issued, based upon careful collation with the earliest and best manuscripts. The same need of new critical editions applies also in the case of too many works that have been more recently printed or reprinted, either in the great sets like MIGNE's *Patrologia* or by individual editors. But as these inferior editions are at least accessible, they should perhaps wait for revision until the three preceding groups have been made available. Finally, there are those medieval scientific and medical writings which have been recently and either critically or at least fairly satisfactorily edited, and which there is the least occasion for including at present in such a Corpus. Even they, however, are so scattered about in a variety of publications, some of them having appeared a few pages at a time in non-consecutive numbers of a periodical, that their aggregation in a single collection would certainly be a great convenience. It furthermore will occasionally happen that while some of an author's works have been printed, others are still in manuscript and that it would be desirable to combine them all in a single fresh volume or edition.

It might seem at first glance the most satisfactory arrangement to attempt to include all works of medieval science in Latin and to issue the successive volumes in the chronological order of their authors and composition, beginning from the early middle ages. However ideal this procedure might be, it must be rejected at present as impractical. The high cost of printing and publishing now prevalent, especially in the case of Latin texts, makes it unlikely that so ambitious a project could be financed. Even if it could, the fact that all the authors and treatises are not yet known and that some of those which are known have not yet been dated, makes the observance of such an order impossible for the present. Furthermore, beginning with the earlier authors would not be the most immediately helpful procedure, since as a rule they are the more accessible now (1) and, scientifically, the less important. It would therefore seem advisable to initiate the Corpus by publication of those works which are now inaccessible, for which there is the greatest need, and which scholars are ready to edit.

One also would wish to avoid all appearance of rivalry or interference with existing enterprises and publications which have contributed so much towards increasing our knowledge of medieval science, such as the *Beiträge zur Geschichte der Philosophie*, the *Abhandlungen zur Geschichte der mathematischen Wissenschaften*, *Sudhoffs Archiv für Geschichte der Medizin*, *Bibliotheca Mathematica*, recently resuscitated through the aid of the American Mathematical Society, and the publication by the Clarendon Press under the editorship of ROBERT STEELE of *Opera hactenus inedita Rogeri Baconi*. The Polish Academy has a proposal for publishing the Latin translations of ARISTOTLE which were current and cited in the medieval period. It would be foolish to duplicate what such agencies have already accomplished or to discourage existing enterprise by planning to cover the same ground.

Such considerations will serve to explain why certain authors and treatises are omitted from the ensuing prospectus. There has also been the problem of determining what categories of works to include under the general caption, scientific. Possibly

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(1) And that sometimes in critical editions, such as BUBNOV's edition of the *Opera mathematica* of GERBERT, Berlin, 1899, or the *Etymologiae* of ISIDORE OF SEVILLE by M. W. LINDSAY, Oxford, 1911.

medical works should constitute a distinct Corpus, but medicine and natural philosophy were so closely associated in medieval education and universities, and the same writers so often composed treatises of medicine and astronomy or mathematics, that it seems almost unnatural to separate them. Treatises on astronomy, mathematics and music by a single author are another frequent phenomenon, but writings concerning music have been generally omitted. Many are already accessible in COUSSEMAKER's *Scriptorum de musica mediæ ævi nova series* or in GERBERT's older collection. The accounts of medieval travelers have also been excluded from the present prospectus, valuable as they are for the history of geography, and no attempt has been made to deal with maps and *portolani*.

How far to include the translation of scientific works from Greek, Arabic and Hebrew is another difficult question. To attempt to include all would make the Corpus very voluminous and expensive. Yet these versions were characteristic of their time and differed markedly from later translations, and many of them are essential to have at hand in order to trace references and citations. Nevertheless in the ensuing prospectus most of them are omitted, even unto JACOBUS ANGELUS's translation of the Cosmography of PTOLEMY, and all the translated works of GALEN except the *Ars parva*. But some works like the *Canon* and *Sextus naturalium* or *De anima* of AVICENNA and the Latin DIOSCORIDES were so basic in medieval culture and are so inaccessible now that it seems imperative to include them. This also holds true for works from Greek and Arabic which are extant only in Latin translation. Occult science and astrology have been for the most part omitted, but were so intertwined with the other science of the time that their inclusion to some extent cannot be avoided and should not be, or a false impression would be given of the state of thought.

It will be seen that in the effort to reduce expense the proposed Corpus has been cut down from every side to the very quick, so far as its content is concerned. With respect to style and format, too, it will doubtless be necessary to forego the expensive bindings and the large folio and portly quarto volumes, with their bold type and ample margins, of the great historical sets and collections of days gone by. Such volumes, moreover, are

none too easy to handle, so that a more modest octavo format would actually prove more serviceable. The need for the Latin texts is so urgent that it would seem advisable, while insisting that they be strictly reliable and accurate, to devote the space of the Corpus mainly to the texts themselves rather than to long introductions and an excess of subsidiary apparatus, minor variant readings, and foot-notes. Scholarly Prolegomena might well appear beforehand in the periodicals which would be freed by the Corpus from the burden which they now frequently assume of including new editions of texts. Other scholars would thus be given an opportunity to offer suggestions before the text's appearance.

On the other hand, if this proposed Corpus is to fulfill its purpose, if it is to command the general adherence and loyal support of scholars in this field who are at present editing single texts or extracts from time to time in individual volumes or in periodicals, if it is to induce them to make it henceforth the channel for all such publication on their part, if it is to capture the imagination of the world of learning and take its proper place among historical and scientific collections:—if it is to do these things, then it must be issued in a durable, dignified and attractive form without too close concern as to expense, it must be capably edited, and must draw trained workers and stimulate them to greater activity by providing them with photostats of the necessary manuscripts, defraying their traveling expenses to distant libraries, and offering them something in the way of an honorarium for the arduous and prolonged labor involved in the critical editing of a historical and scientific text.

Some may feel that the time has not yet come for such an enterprise, and that further exploration of the new field and tentative experiments are first necessary. But when one sees how many texts, extracts, and fragments are already appearing in solitary editions, in appendices to general works and monographs, in periodicals, and in doctoral dissertations, one realizes that the need is already pressing for a general repository to combine and render more accessible and uniform future activity of this sort. The task will be a slow and long one. Many years will necessarily elapse before its completion. Perhaps it will still be in process in the year of our Lord 2130, just as the *Acta Sanctorum*,

of which the first volume was published by BOLLANDUS in 1643, is still in process today, while the *Histoire littéraire de la France*, initiated in 1733 by the Congregation of St. Maur, has so far covered only to the fourteenth century. But it is doubtful if we shall hasten the finish by delaying the start.

Below is appended the list of the authors or kinds of works which it seems most imperative to include in such a Corpus. They have been roughly numbered to indicate about how many volumes they might fill. Sometimes one author will make a rather short volume and the next a very long one, but they will probably average up about as indicated. Titles, manuscripts, and old editions have, for the sake of brevity, usually not been listed, but much material of this sort can be supplied, if desired. Suggestions will be welcomed from others as to authors and works which might be added to the prospectus, or substituted for certain names already listed. The ideal of the Corpus may be briefly summarized thus : as a rule no satisfactory and accessible text will be duplicated; nothing previously printed will be republished without critical revision from the manuscripts ; a great body of past thought and writing, rich in significance and illuminating for the development of the human mind and knowledge, will be placed in print for the first time.

## ENCYCLOPEDIC WORKS ON NATURE

### Number of volumes

- 1-8 VINCENT OF BEAUVAIS, *Speculum naturale*. It is desirable to republish this great work soon, since of previous editions the inaccessible incunabulum of 1485 in two great folio volumes is alone trustworthy.
- 9-10 THOMAS OF CANTIMPRÉ, *De natura rerum*: never printed.
- 11-13 BARTHOLOMEW OF ENGLAND, *De proprietatibus rerum*: old editions scarce and should be revised from Mss.
- 14-16 DOMINICUS BANDINUS of Arezzo, *Fons memorabilium universi*: or as much of it as can be recovered.

The following works, since they are either mere compilations of facts from nature to be used as the basis of moralizing, or are miscellanies in which facts concerning nature constitute only

a part of the work, may be tentatively omitted from the Corpus, although eventually they also should probably be added as affording light on the general attitude of those times towards nature and science.

PETRUS BERCHORIUS, *Reductorium, Repertorium*, etc.

JACOBUS MAGNUS, *Sopholegium*.

JOHN OF SAN GIMIGNANO, *Summa de exemplis*.

*Liber moralitatum rerum naturalium*.

*Multifarum de diversis*.

*Pantalogia rerum naturalium*: possibly identical with PETRUS

A FANO SERVATORIS, *Pantheologia*.

*Septiformis de moralitatibus rerum nature*.

The treatises that follow, on the other hand, appear to address themselves directly to problems of natural philosophy in a scientific spirit.

- 17 BATE, HENRI, *Speculum divinatorum et quorundam naturalium*.
- 18 BONETUS, NICOLAUS. *Physica* and *Theologia naturalis*.
- 19 BURLEY, WALTER, *De principiis naturalibus*.
- 20 GERARDUS HARDEWICENSIS, *Epitomata totius philosophiae naturalis*, or, *Reparationes Alberti*.
- 21 HERVAEUS NATALIS, *Natural philosophy*.
- 22 JAMES OF ALEXANDRIA, *Super totam philosophiam, naturalem et moralem*.
- 23 IOHANNES DACUS, *Philosophia super omnes scientias*.
- 24 IOHANNES DE SICCA VILLA, *De principiis naturae*.
- 25 IOHANNES DE SPERNEGASSE, *Questiones in totam philosophiam naturalem*.
- 26 NICOLAUS FRANCUS VIMACUUS, *Epitome philosophiae naturalis*.  
NICOLAUS DE ORBELLIS, *Cursus librorum philosophiae naturalis secundum viam... Scoti*.
- 27 RICHARD OF LAVENHAM, *Speculum vel philosophia naturalis*.

The following works may be regarded as too late to include in a Corpus of medieval science, although written before 1500: also they were printed in old editions, which, however, are now rather inaccessible.

GEORGE VALLA, *De expetendis et fugiendis rebus*.

HIERONYMUS SAVONAROLA, *Compendium totius philosophiae*.



THEOPHILUS CREMONENSIS DE FERRARIIS, *Propositiones ex omnibus Aristotelis libris*.

JOHANNES PEYLIQK, *Philosophiae naturalis compendium*.

HERMOLAUS BARBARUS, *Compendium scientiae naturalis ex Aristotele*.

LAURENTIUS BONINCONTRI MINIATENSIS, *Rerum naturalium et divinarum*.

## AUTHORS IN PARTICULAR FIELDS

Next we turn to more particular fields and divisions of natural science and to individual authors, observing something like chronological order, but reserving astronomy and medicine for later separate treatment.

- 28 *Early Herbals*: PSEUDO-APULEIUS, MACER, WALAFRID STRABO. L. CHOULANT's ed. MACER FLORIDUS *De viribus herbarum*, of 1832 is rare, not being found in the Harvard library and not being mentioned in SARTON's *Introduction to the History of Science*.
- 29 DIOSCORIDES, medieval Latin versions of (see my *History of Magic*, I, 604).  
AURACHER and STADLER's ed. of the early translation is scattered through 5 vols. of *Rom. Forsch.* Of the later version on which PETER OF ABANO commented there are only old eds.
- 30 *Later Herbals*: PLATO DE DUISIS, RAYNAUDUS, RINIUS, RUFFINUS, etc.
- 31 BEDE's writings on nature, with similar or related treatises, require re-editing because expurgated in past editions, as HAURÉAU pointed out. With them in the same volume might be combined their derivatives such as the *Liber Iparchi*: see HASKINS, *Mediaeval Science*, 1924, p. 89.
- 32 *Treatises on the arts*: Compositiones ad tingenda, Mappe clavicula, THEOPHILUS, HERACLIUS, etc.
- 33 *Marbod and other Lapidaries*.
- 34 *Latin translations of* ALKINDI and other Arabic science.
- 35 *The Pseudo-Aristotle*.
- 36 Medieval Latin treatises ascribed to PLATO, GALEN, PTOLEMY, etc.
- 37 *Hermetic books*.
- 38 *The Pseudo-Geber*: Latin works of alchemy attributed to.

- 39 ADELARD OF BATH: partly a question of reediting and bringing together, partly of publishing from Mss. for the first time.

It would be a great convenience to bring together his works in one volume. The *Questiones naturales* are found only in rare old editions whose text is faulty and needs revision from the Mss. While some of his mathematical writings have been more recently and critically edited, they are scattered in different collections and periodicals. Other works are still found only in Mss. On the other hand, some of ADELARD's treatises, such as those on the abacus, astrolabe, and falcons, would perhaps more appropriately go into the volumes dealing with those subjects.

- 40 WILLIAM OF CONCHES and similar works.

A combined new edition of his works is highly desirable, although perhaps others are of more immediate necessity. The old editions of *Philosophia* and *Dragmaticon* were not in his name and further require reediting from the numerous Mss. His Glosses on the *Timaeus* were printed by COUSIN only in part.

Although DANIEL MORLEY wrote half a century later, the similarity of his *De philosophia* to WILLIAM's *Philosophia* suggests combining them in one volume. SUDHOFF's recent edition of DANIEL is somewhat faulty.

AUBERT OF REIMS, *Philosophia*, might be added to the same volume.

- 41 HERMANN OF CARINTHIA, *De essentiis*, and such works on the universe and elements as are found in Ms. Galba E iv. of the British Museum.

- 42-43 MICHAEL SCOT, *Liber introductorius* and *Liber particularis*.

- 44 MICHAEL SCOT, minor works and alchemies ascribed to.

- 45 *Kiraniides* and associated treatises.

- 46 WITelo, JORDANUS NEMORARIUS, etc.

Almost the only work of ALBERTUS MAGNUS in the field of natural science that has been published in a modern critical edition from manuscripts is the *De animalibus* (a text covering 1598 pages and not wholly free from faults). The remaining scientific writings of ALBERT might be distributed in volumes somewhat as follows :

- 47-48 *Physics*.

- 49 *Coelo et mundo.*
- 50 *Meteoris*, etc.
- 51 *Mineralibus*, etc.
- 52 *De generatione et corruptione*, etc.
- 53 *De anima*, etc.
- 54 *Secrets and alchemical treatises* ascribed to ALBERT.

The remaining authors in this section, mostly of the fourteenth and fifteenth centuries, are arranged alphabetically rather than chronologically.

- 55 BLASIIUS OF PARMA: works in the fields of physics, mathematics, and astronomy (see *Archeion*, 9, 177-190).
- 56 FONTANA, JOHN: mathematical, mechanical and military works.
- 57 HENRY OF HESSE: on natural causes and effects, and against astrology.
- 58 JOHN MICHAEL ALBERT, *De constitutione mundi.*
- 59 JOHN OF RUPESSISSA: alchemical.
- 60 KILWARDBY, ROBERT.
- 61 LUDOVICUS DE ANGULO, *De figura seu imagine mundi.*
- 62 MARIANUS JACOBUS (TACCOLA), *De machinis libri decem.*
- 63 MARLIANUS, IOHANNES: physics and mathematics.
- 64 MARZIO, GALEOTTO: *De homine, De doctrina promiscua, De incognitis vulgo.*
- 65 NICHOLAS OF CUSA: scientific and mathematical works.
- 66 ORESME, NICOLAS: physics, mathematics, and astronomy.
- 67 PAUL OF VENICE.
- 68 PECKHAM, JOHN.
- 69 PETRUS CRESCENTIIUS, *De agricultura.*
- 70 ROBERTUS CRICKELADENSIS, *Defloratio Plinii.*
- 71 SUISETH, RICHARD, *Calculationes.*
- 72 THEODERICUS SAXO or TEUTONICUS.
- 73 VALTURIUS, ROBERTUS *De re militari.*

The fourteenth and fifteenth centuries were a time when there was much scientific discussion of such matters as proportion, motion, velocity, the intension and remission of forms, *de maximo et minimo, de instanti, de generatione*. These matters were treated by some of the authors above mentioned. Until such works have been more studied, it is difficult to say whether it would

be better to combine some of them topically or to keep them under their respective authors. Some of these not yet mentioned are :

- 74 ALBERT OF SAXONY.
- 75 ANGELUS DE FOSSANBRONO.
- 76 BRADWARDINE, THOMAS, archbishop of Canterbury.
- 77 CAJETAN DE THIENIS.
- 78 FRANCISCUS DE FERRARA.
- 79 GUIDO DE BONONIA.
- 80 HUGH OF SIENA.
- 81 JAMES OF FORLÌ.
- 82 JOHN OF HOLLAND.

Scientific conceptions and hypotheses at this time were to a large extent enunciated in commentaries upon the works of ARISTOTLE in natural philosophy, particularly—it would seem—the *Physics* and *De anima*. The Commentators upon ARISTOTLE therefore, voluminous though they be, cannot be neglected in a Corpus of medieval science, although such particular works as, upon further study, prove relatively jejune and lacking in suggestiveness may be omitted.

- 85-86 AVERROES.
- 87 ALBERT OF SAXONY.
- 88 APOLLINARIS DE OFFREDIS OF CREMONA.
- 89 BOETHIUS DACUS.
- 90 BURIDAN, JEAN.
- 91 BURLEY, WALTER.
- 92 CAJETAN DE THIENIS.
- 93 DOMINICUS DE CLAVASIO.
- 94 FRANCISCUS DE MAYRONIS.
- 95 GRATIADEI OF ASCOLI.
- 96 GREGORY OF NORBURY.
- 97 JAMES OF SICILY.
- 98 JOHN CANONICUS.
- 99 JOHN DIDNESHEN, DISNEHALE, DYMSDALE, or TYDENSHALE.
- 100 JOHN DE CHYMIACHO.
- JOHN OF JANDUN.
- 101 JOHN MARBRES CATALANUS.
- 102 JOHN MARCHANOVA.
- 103 JOHN OF ORLÉANS.

- 104 JOHN SCHARPE.
- 105 LONDORIUS.
- 106 PETRUS TRAPOLINUS.
- 107 NICCOLÒ DA FOLIGNO.
- 108 RICHARD OF LAVENHAM.
- 109 RUDIGERUS DE ROERMUNDIA.
- 110 SIMON OF FEVERSHAM.
- 111 THADEUS OF PARMA.
- 112 THEMON JUDAEUS.
- 113 THOMAS DE WILLETONA.
- 114 VERSORIS, PETRUS DE.

Various anonymous treatises exist under the three following heads, but three volumes would certainly not suffice for them :

- 115 Nature: questions and *Summae* concerning.
- 116 Philosophy.
- 117 Physics.

A number of brief treatises by named authors as well as other anonymous writings might be grouped under these captions :

- 118 Agriculture and Plantations: PSEUDO-ALBERT, NICOLAUS BOLARDUS, TANAGLA, etc.
- 119 Colors: JOHN OF BOLOGNA, PETRUS S. AUDEMAR, etc.
- 120 Experimenta: BENJAMIN JUDAEUS, CONRAD HILDENSER, EGIIDIUS CANCELLARIUS, NICOLAUS, NICHOLAS OF POLAND, JOHN DE S. EGIDIO, LUCAS DE MALLYNG, *Portior medicinarum*, *Secretum philosophorum*, UBERTINUS, VIDIDENUS, etc.
- 121 Waters, medicinal, chemical, etc.: ALBERTUS DE ALAMANNIA, ALPHEUS, BISTICCIUS, JOHN nephew of BONIFACE VIII, FRANCISCUS DE PERUSA, JOHN GALLACIUS, etc.

Even after the above inclusions a large amount of alchemical literature would be left to be sifted and embodied or rejected. Until alchemical works have been better identified, it is risky to hazard a classification, but tentatively may be suggested :

- 122 Alchemical tracts ascribed to ARNALD OF VILLANOVA and RAYMOND LULLY.
- 123 BERNARD OF TREVES, THOMAS OF BOLOGNA, etc.
- 124 Writings of English alchemists.
- 125-126 Other alchemical tracts.

## ASTRONOMY

By omitting the vast literature of judicial astrology—which however, should in time have a Corpus of its own printed—and most arithmetics, geometries, and other mathematical works not related to physics and astronomy, the number of volumes in the astronomical section of the Corpus could be kept within reasonable limits.

- 127 Calendars.
- 128 Computi.
- 129 Almanachs.
- 130 Astronomical Tables and Canons.
- 131 Treatises on the astrolabe.
- 132 Treatises on other astronomical instruments, as *Horologium viatoris*, JOHN DE DONDIS *Opus planetarii*, FRANCO DE POLONIA TURKETUS, JOHN DE LOCROU *Solitarium*, JOHN OF MONTPELLIER on the old quadrant, RUDOLPH OF BRUGES, etc.
- 133 NIMROD the astronomer and other astronomical treatises before the translations from the Arabic.
- 134 Works of the twelfth century such as those of WALCHER, PEDRO ALFONSO, RAYMOND OF MARSEILLES, the 25 chapters in Ms. BN 15015, fols. 200-233v.
- 135 Comets and meteors.
- 136 Treatises on the motion of the eighth sphere.
- 137 Theory of the Planets: CAMPANUS, PETRUS DE MUTINA, etc.
- 138 Sphere of SACROBOSCO and commentaries upon it.

The astronomical and mathematical works of:

- 139 ABANO, PETER OF.
- 140 ALFONSO THE WISE.
- 141 ALLIACO, PETRUS DE.
- 142 ANSELMIS, GEORGIUS DE.
- 143 BASINIUS OF PARMA.
- 144 BERNARD OF VERDUN.
- 145 BIANCHINI, GIOVANNI.
- 146 COLLEMAN, JOHN.
- 147 DAGOMARI, PAOLO.
- 148 FUSORIS, JEAN.
- 149 JOHN OF SAXONY.
- 150 LEO DE BALNEOLIS.

- 151 LINERIIS, IOHANNES DE.
- 152 LORENZO LORENZI.
- 153 MAUDITH, JOHN.
- 154 MURIS, IOHANNES DE.
- 155 PAUL OF MIDDELBURG.
- 156 PEURBACH and REGIOMONTANUS.
- 157 PROFACIUS JUDAEUS.
- 158 PROSDOCIMO DE' BELDOMANDI.
- 159 RICHARD OF WALLINGFORD.
- 160 TOLHOFF, JOHN: WILLIAM OF WORCESTER.
- 161-163 GERARD OF CREMONA's translation of the *Almagest* of PTOLEMY.
- 164 BASEL. IOH. Commentary on the *Almagest*.

## MEDICINE

If medical works were to be included in the Corpus of Medieval Latin Scientific Literature, the following subjects and authors would be among those to which attention should first be turned. Authors available in modern editions such as NEMESIUS and ALDOBRANDIN OF SIENA, and those published by PAGEL or PANSIER, or found in the collections of DE RENZI, GIACOSA, and SIGERIST's *Texte zur frühmittelalterlichen Rezeptliteratur*, are not included here. A distribution in volumes is roughly suggested.

- 1-4 The *Canon* of AVICENNA in the medieval Latin translation, containing approximately a million words. The most inclusive and influential single work of medieval medicine. The old editions are inaccessible.
- 5-7 ORIBASIIUS in early medieval translation.
- 8 ALEXANDER OF TRALLES in early medieval Latin translation.
- 9 The group of treatises consisting of the *Isagoge* of JOHANNITIUS, *Aphorisms and Prognostics* of HIPPOCRATES, *Philaretus de pulsibus*, *Theophilus de urinis*, *Tegni* or *Ars parva* of GALEN.
- 10 Anonymous tracts and miscellanies found in early Mss. (up to the 12th century) and which do not fall under any of the later subject groupings.
- 11-13 Medieval Latin translations of RASIS.
- 14-16 CONSTANTINUS AFRICANUS, original works and translations.
- 17 GILBERT OF ENGLAND.
- 18-19 PETRUS HISPANUS.
- 20 BERNARD GORDON.
- 21-22 ARNALD OF VILLANOVA.

- 23-25 PETER OF ABANO.
- 26 ALBICUS, archbishop of Prag.
- 27 ANTONIUS DE PARMA.  
BAGELLARDUS, PAUL.
- 28 BARTHOLOMEW OF BRESCIA.
- 29 BENIVIENI, ANTONIO.
- 30 BERTRUCCI, NICCOLÒ.
- 31 DONDIS, JACOBUS DE.
- 32 FERRARI DE GRADI, MATTEO.
- 33 GADDESSEN, JOHN OF.
- 34 GALVANUS DE LEVANTO.
- 35 GARBO, DINO DEL.
- 36 GARBO, TOMMASO DEL.
- 37 GARIOPONTUS.
- 38 GENTILE DA FOLIGNO.
- 39 GERARDUS DE SOLO, of Bourges.
- 40 GILES DE CORBEIL.
- 41 GUAYNERIUS, ANTONIUS.
- 42 GUIDO OF FORLÌ.
- 43 HONESTIS, CHRISTOPHORUS DE.
- 44 HUGH OF SIENA.  
JACOBUS DE PARTIBUS.
- 45 JACOBUS DE CAPELLUTIS of Parma.
- 46 JAMES OF FORLÌ.
- 47 IOHANNES CALORA OF MODENA.  
IOHANNES DE CONCOREGGIO.  
IOHANNES DE CORPO.
- 48 JOHN OF PARMA.
- 49 JOHN OF ST. PAUL.
- 50 JOHN OF TORNAMIRA.
- 51 MAGORINUS.  
(NICCOLO FALCUCCI of Florence: his enormous medical compilation, which would easily fill a dozen volumes, seems hardly worth the expense of reprinting from the old editions of 1484 etc., since it is largely unoriginal).
- 52 JORDANUS DI TURRE.
- 53 PETER OF TOSSIGNANO.
- 54 PETRUS DE YBERNIA.  
RICHARD OF ENGLAND.
- 55 SANCTA SOPHIA family: GIOVANNI, GALEAZZO, MARSIGLIO,  
etc.
- 56 SAVONAROLA, MICHAEL.



- 57 SCARPARIA, ANTONIUS.
- 58 SIGISMUNDUS DE POLCASTRIS,
- 59 SILLANUS DE NIGRIS,
- 60 SILVATICUS, MATTHIAS.
- 61 SIMON CORDO OF GENOA.
- 62 *Tacuinum sanitatis*.
- 63 THADDEUS OF FLORENCE.
- 64 TORNIVS, BERNARD.
- 65 URSO and URSUS.
- 66 VALESCUS DE TARANTA.
- 67 WILLIAM OF VARIGNANA.
- 68 TORRIGIANO DE' TORRIGIANI, PIETRO.

Other treatises, especially anonymous works, might be grouped in the following volumes devoted to certain subjects or phases of medicine.

- 69 *Anatomy*.
- 70 *Antidotaria and Receptae*: NICOLAUS and his commentators, ARNULF OF FLANDERS, GORGI DE FLORENTIA, PLATEARIUS, etc.
- 71 *Astrological medicine and Bleeding or Phlebotomy*: a few specimen treatises such as those of ANDALÒ DI NEGRO, JOHN OF AQUILA, JOHN GANIVET, NICOLAUS DE PAGANICA, LEONARDUS QUALEA.
- 72 *De conservatione sanitatis*: treatises of BENEDICTUS REGUARDATUS, JACOBUS TOLOSANUS, JOHN OF TOLEDO, PHILIP, etc.
- 73 *Consilia*: ACHILLES GASSARI, ADAE DE RADINGES, BARTHOLOMEW DE MONTAGNANA, MARSILIUS DE SANCTA SOPHIA, FRACINUS, etc.
- 74 *Critical days*: ALVARUS HISPANUS, AMICUS DE SULMONA, BARTHOLOMEW *de crisi et criticis diebus*, HUGO DE CIVITATE CASTELLIS.
- 75 *Fevers*: ANTONIUS MALGLANI de Chesio, FERRARIUS, JOHN OF CONCOREGGIO, PETRUS ALBI of Montpellier, PHILO SEPTIMIUS, etc.
- 76 *Gout, Pains in Joints, Rheumatism*: JAMES OF COBLENTZ, THOMAS OF NEWMARKET, etc.
- 77 *Poisons*: MAIMONIDES, PETER OF ABANO, WILLIAM DE MARRA, FRANCIS OF SIENA, CHRISTOPHER DE HONESTIS, JOHN OF AREZZO, etc.
- 78 *Practica*: BERNARD ALBERT, JOHN JACOBI, ROGER DE BARON, WILLIAM OF BRESCIA, etc.

- 79-82 *Surgery*: PETRUS DE ARGELLATA, BONGIOANNI DALL' ORTO, JOHN OF MILAN, LEONARD OF BERTIPAGLIA, MILO, PHILO OF PARIS, RAYMUNDUS, ROGER OF PARMA, THEODORIC OF CERVIA, WILLIAM OF SALICETO, etc.
- 83 *Urinoscropy*: WILLIAM OF ENGLAND, WALTER AGILON, ALBERT OF MONTPELLIER, BARTOLUS, HENRY DANIEL, FERNANDUS DE CORDOVA, etc.
- 84 *Veterinary*: JORDANUS RUFUS of Calabria, JACOBUS AURIA, LAURENTIUS RUZIUS, THEODORICUS BURGUNDIONIUS of Lucca, THEODORIC OF CERVIA, etc.
- 85 *Pest tracts*: although many have been recently published, others remain in manuscript form as yet.

*New York City.*

LYNN THORNDIKE.



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A pest tractate before the black death

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## A pest tractate before the black death

By LYNN THORNDIKE, New York

AUGUSTINE OF TRENT, in addition to being a member of the Order of Friars Eremites of St. Augustine, was a lecturer at the University of Perugia and chaplain to NICHOLAS ABREIN from Brünn in Moravia, who was bishop of Trent from 1336 to 1347. To this prelate, on July 12, 1340, AUGUSTINE directed from Perugia an astrological and medical work discussing especially the sixth house of the figure for that year, "which sixth house is called that of infirmities according to the astrologers". AUGUSTINE's treatment is of especial interest because he deals with "the pestilence of infirmities" which occurred in 1340. Both in his astrological explanation of these diseases and his instructions how to guard against them he seems a precursor of the pest tractates which were presently to be called forth in such numbers by the great mortality of 1348 and its many subsequent recurrences. His treatise deals with both past and future, interpreting astrologically what has already occurred in 1340, and making predictions for the remainder of the year. Yet his work is to be distinguished from those almanacs, ephemerides, *tacuína*, and other predictions for particular years based on the astrological doctrine of revolutions which became so common during the later middle ages. AUGUSTINE aims not merely to treat of the particular year, 1340, but to set forth general rules which will be useful to medical men and to mankind at large in other years. This was a prophetic instinct on his part, for before a decade had passed the great pestilence of 1348 was to call forth regimens of health similar to his in increasing numbers.

Two manuscripts of AUGUSTINE's work are at present known to me.<sup>1)</sup> Both were once the property of HARTMAN SCHEDEL (1440 to 1514) who seems to have brought them to Germany where they are now to be found in the library at Munich, where one of them

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<sup>1)</sup> CLM 276, 14<sup>th</sup> century, fols. 87<sup>r</sup>—91<sup>r</sup>, double-columns. CLM 647, written about 1477, fols. 1<sup>r</sup>—20<sup>v</sup>.

is incorrectly catalogued as a geomancy.<sup>1)</sup> Actually they contain the same work, except that CLM 276 leaves off in the second column of folio 91 recto at the end of the *Quintum principale* without giving a promised *figura celi*, whereas CLM 647, which reaches this same point at the bottom of folio 18 recto, continues with astrological figures and accompanying text to folio 20 verso. This second manuscript is a copy in SCHEDEL's own neat handwriting.

The dates of the bishop to whom the work is addressed show that the year 1340, although specified only in SCHEDEL's later copy, cannot be a mistake of a copyist for 1349. This is further rendered out of the question by the fact that the years 1338 and 1339 are distinctly mentioned as preceding the year under consideration. AUGUSTINE disagrees with certain medical men, of Perugia especially, who had ascribed the prevalent diseases to heavy rains, for the reason that almost continuous rain fell in 1338 and 1339, yet there was no pest of sicknesses as there was in 1340.<sup>2)</sup> Moreover, the date 1340 is mentioned in two connections, as the

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<sup>1)</sup> The following descriptions are from the *Catalogus codicum manuscriptorum Bibliothecae regiae Monacensis*, Vol. III, pt. 1, 2<sup>nd</sup> edition, Munich 1892, pp. 70 and 168.

"276 (fol. 69—74 membr.) 2<sup>o</sup>. miscell. s. XIV, 161 fol. Liber H. Schedelii . . . f. 87 Augustinus de Tridento lector Perusii ord. her. opusculum geomant. de sexta domo. f. 91 b Remedia geomantica et alia . . ."

"647. 8<sup>o</sup>. s. XV. 162 fol. scripsit H. SCHEDEL. Fol. 1 Augustini de Tridento, lectoris Perusii, ord. fr. herem. epistola astrologica ad Nicolaum episc. Tridentinum de anno 1340. f. 23 Johannis de Glogovia accidentia stellarum a. 1476." Really the work of JOHN OF GLOGAU seems to begin at fol. 21<sup>r</sup>, which is blank except for the heading, "IUDICIUM ANNI 1476".

<sup>2)</sup> CLM 647, fol. 19<sup>v</sup>: "Anno domini 1340 die 24 mensis februarii fuit coniunctio solis et lune ante meridiem hora quarta minutis 10.

Per istam figuram et specialiter per 12<sup>am</sup> domum et coniunctionem factam in ipsa fuit permutatio temporis in vere. Unde quidem (sic) medici in variis regionibus et specialiter perusii iudicaverunt infirmitates istius anni accidisse ex pluvia illa, quod manifeste est falsum. Tum quia in M<sup>o</sup>CCC<sup>o</sup> 38 et 39 fuerunt pluvie quasi continue, et tamen non fuit pestis egritudinum ut in isto anno. Tum quia si pluvie fuissent cause, accidissent in regionibus egritudines quando fuerunt pluvie et equaliter, quod est falsum. Tum etiam infirmitates istius anni deberent procedere ut plurimum ex frigiditate et humiditate, quod manifeste est falsum. Ymo sunt ex humoribus calidis et adustis ut experientia docet. Ideo est dicendum quod infirmitates istius anni procedunt ex mala constellatione planetarum regnantium, ut declaravi in primo principali. Et sunt in aliquibus regionibus citius, in aliquibus tardius, infirmitates secundum directionem martis in ascendentibus regionum, ut patet in Florentia."

year of a conjunction of sun and moon on February 24<sup>th</sup>), and again in an astrological figure where it is written twice in different ways.<sup>2)</sup>

Below I reproduce the Latin text from the two Munich manuscripts of the opening passage of AUGUSTINE's treatise and its second, third, and fourth parts, which are those of most medical interest. The first and fifth parts are primarily astrological, as are the text and diagrams which follow the fifth part in CLM 647 but are not contained in CLM 276. Of this closing matter, which should perhaps be regarded as the sixth part, although it is not definitely so designated in the manuscript, the most interesting portion has already been given in footnote 2 on page 347. It includes an attribution of the diseases of 1340 to hot and burning humors, which suggests, though of course it is far from demonstrating, that these earlier epidemics may have to some extent been forerunners of the great mortality or Black Death of 1348.

AUGUSTINE OF TRENT ON THE YEAR 1340: OPENING  
PASSAGE CLM 276, FOL. 87<sup>r</sup>, COL. 1; CLM 647, FOL. 1<sup>r</sup>

Reverendo in Christo patri ac domino suo domino Nicolao Episcopo Tridentino frater Augustinus de Tridento lector perusii vester Capellanus et filius in Christo Ordinis fratrum heremitarum sancti Augustini se ipsum cum humili recommendatione et orationem perpetuam in domino. Nam secundum sententiam principis perypateticorum Aristotelis in methaphysica sua, Celum et natura dependent a primo principio. Ex quo verbo elicitur statim quod omnia dependent a deo non tantum in genere cause similis sed efficientis et creantis ut theologi et fideles astruunt. Ptolomeus vero et astrologi dicunt omnia transmutabilia dependere a circulo zodiaco, a coniunctionibus et ab aspectibus planetarum, principaliter tamen a deo. Secundum istum circulum zodiaci formabant et formant continue astrologi figuras revolutionum annorum mundi, figuras nativitatum, et figuras electionum, mediantibus quibus figuris et aspectibus planetarum iudicabant et iudicant super accidentia mundi, super accidentia nativitatum, et super accidentia (CLM 647, fol. 1<sup>r</sup>) particularia personarum. Discutere omnia talia per ordinem esset nimis prolixum. Ad presens autem in genere intendo aliqua discutere circa et sextam domum figure istius anni que domus sexta dicitur infirmitatum secundum astrologos.

<sup>1)</sup> For the Latin see the first lines of the preceding footnote.

<sup>2)</sup> CLM 647, fol. 19<sup>r</sup>: “. . . istius anni 1340” and “. . . Anno domini M<sup>o</sup>CCC<sup>o</sup>40”.

Iuxta hoc valde breviter in generali 6 declarabo per ordinem et erunt utilia (ultima in CLM 276) in isto anno et in aliis annis concurrentibus similibus constellationibus. Etiam utile erit hoc opusculum quia regule perpetue quamplures ibi continentur utiles medicis et universis personis. Determinavi infra-scripta in universitate studii Perusii propter ignorantiam infirmitatis. Nam in ista pestilentia infirmitatum medici Florentie Perusii Rome atque in ceteris regionibus Ytalie tribuebant unam medicinam omnibus humoribus, ut scriptum fuit mihi, ignorantes radices infirmitatum. Et accidit error iste pestiferus multis medicis propter ignorantiam astronomie.

Ad evidentiam autem dicendorum. In primo principali ostendam 9 conclusiones et plura correlaria. Nam primo ostendam quod egritudines istius anni fuerunt et erunt ratione male constellationis scilicet ratione martis et sexte domus (CLM 647, fol. 2<sup>r</sup>). 2<sup>o</sup> ostendam in speciali cuius nature fuerunt et erunt egritudines istius anni in generali. 3<sup>o</sup> assignabo unde proveniant egritudines particulares et permixte et simplices. 4<sup>o</sup> declarabo qualiter providendum sit egritudinibus simplicibus et permixtis. 5<sup>o</sup> declarabo quibus personis accidunt egritudines istius anni in generali ratione planetarum. 6<sup>o</sup> declarabo quibus membris accident egritudines specialiter et radices ex quibus procedant. 7<sup>o</sup> declaro terminos infirmitatum utrum sint terminales in bonum (totum in the MSS) vel in malum (CLM 267, fol. 87<sup>r</sup>, col. 2) et qualiter pronosticatio fit. 8<sup>o</sup> declarabo regiones quibus contingunt infirmitates secundum principia astrologorum. 9<sup>o</sup> declarabo aliququaliter ascendens civitatis vestre Tridentine unde vestri medici poterunt elicere varia accidentia in isto anno et aliis secundum coniunctionem et oppositionem planetarum. . . .

**AUGUSTINE OF TRENT ON THE YEAR 1340: SECUNDUM PRINCIPALE, ETC. CLM 276, FOL. 88<sup>r</sup>, COL. 2; CLM 647, FOL. 8<sup>r</sup>**

Sequitur secundum principale ubi declaratur qualiter persone sane se habeant custodire in isto anno et in aliis annis quando similis constellatio regnaret. Regule istius secundi (CLM 276, fol. 89<sup>r</sup>, col. 1) principalis (CLM 647, fol. 9<sup>r</sup>) sunt utiles omni tempore et sunt perpetue. Continet inquit istud principale 12 conclusiones principales.

Caveant sibi primo a fructibus quia frequenter ipsis comestis et inordinate varios luctus dabunt unde Avicenna 3<sup>a</sup> fen primi canonis capitulo de regimine eius quod comeditur dicit: „Oportet ut sanitatis conservator studeat ne cibi ipsius substantia sit aliquod nutrimentum medicinalium sicut olera et fructus.“ Ex quo trahitur quod omnes fructus in genere sunt mali. Et subdit Avicenna fructus tamen nutrienti magis similes sunt ficus et uve valde mature et dactili in regionibus et civitatibus in quibus esse consueverunt. Et in quarto, fen prima, capitulo de cura

februm putridarum in generali dicit quod omnes fructus nocent febricanti cum ebullitione sua et corruptione in stomaco.

Caveant sibi 2<sup>o</sup> a rebus crudis ut a cepis scalonibus lactucis etc. et precipue saturnini. Consulo tamen hiis qui comedunt lactucas vel portulacas vel similes herbas crudas in aceto ratione caloris accidentalis quod prius eas (CLM 647, fol. 9<sup>r</sup>) aliquantulum faciant bulire<sup>1)</sup> in aqua simplici et deinde extrahantur et comedantur cum aceto loco salliceti.<sup>2)</sup> Nam per talem bulitionem humor terrestris inde tollitur et per consequens magis digestionem conformabunt. Sumantur duo vel tres boli quando oportunitas fuerit. Ista videtur esse intentio cuiusdam in libello regimine sanitatis dicentis, „Lactuca frigida est et humida in primo gradu.“ Et subdit infra ad propositum, „Cocta magis valet quam cruda et modo nascens quam diu nata.“ Et Serapion in libro de simplicibus capitulo 233 dicit de se ipso, „Et ego quidem comedebam lactucas quando eram iuvenis etc.“ Et subdit immediate ad propositum, „Et nunc etiam comedo postquam senui eas elixas etc.“ Cuius ratio potest esse quia elixe facilius transitus sunt propter ablationem materie terrestris etc. Similiter dic de aliis herbis.

Caveant sibi tercio a variis motibus frequentatis nimis et specialiter ab hiis qui abiciunt a substantia et evacuant etc., quia tales motus frequenter inducunt febres et passiones varias non tantum in parte extrinseca sed intrinseca scilicet in medullis, ut tradunt auctores medicine (CLM 647, fol. 10<sup>r</sup>). Hic fuit obiectum a quibusdam medicis ad pauca (CLM 276, fol. 89<sup>r</sup>, col. 2) respicientes de facili enuntiantes et dicentes quod hec regula contradicit multiplicationem speciei humane. Ulterius non potest servari in omnibus quia expedit in aliquibus quod sollicitentur frequenter in istis motibus, aliter possunt perire. Mirabile est de hominibus quod non distinguunt propositiones indefinitas ut docet Aristoteles in *loyca* sua. Dixi de motibus non regulatis quod ab illis se custodient, conformans me in parte dicto illius magni astrologi et medici Michaelis Scoti. Unde inquit Michael Scotus in editionibus suis ad Fridericum<sup>3)</sup> imperatorem dicit, „O imperator, si vivere vis sanus, sit tibi semel in die semel in septimana semel in mense et semel in anno,“ et ex hoc non tollitur multiplicatio speciei humane, ymo per amplius species multiplicatur, individua perfectius conservantur, et per consequens monstra non tot generantur vel generabuntur. Nam per unum actum dispositum acquiritur individuum denumeratum (?) quia secundum philosophum in quinto physicorum, „Generatio fit in instanti.“ Regula inquit<sup>4)</sup>

<sup>1)</sup> Pulire in CLM 276.

<sup>2)</sup> For salicetum? Salletici in CLM 647; sallici or sallicici in CLM 276.

<sup>3)</sup> Federicum in CLM 276.

<sup>4)</sup> Inquam in CLM 647.



simpliciter (CLM 647, fol. 10<sup>v</sup>) non potest servari in omnibus et precipue in martialibus et in quibus virtus planete Veneris predominatur. Nam Michael Scotus magnus medicus et astrologus forte et sine forte locutus fuit secundum complexionem Friderici imperatoris et non secundum complexionem<sup>1)</sup> aliorum. Et per hoc patet ad primum. Ad secundum dicendum quod instantia impedit se ipsam, quia dicit quod expedit, expediens convertitur cum necessario ut alibi declaratur, et necessitas non habet legem. Fiat ergo secundum expedientiam et necessitatem eius, tamen de consilio peritorum medicorum.

Quarto caveant sibi ne fenestras de nocte nec de die dimittant apertas, et quando dormiunt in cameris suis, quia frequenter venti et venticuli flant, nunc ab oriente, nunc ab occidente, nunc a septentrione, nunc ab aquilione etc. Isti venti elevant vapores sepe a locis corruptis et impellunt ad loca habitabilia ubi animalia habitant, que quidem animalia attrahunt vapores corruptos et sic attrahendo animalia et homines inficiuntur quia varie infirmitates inde generantur ex vaporibus corruptis. Ulterius (CLM. 276, fol. 89<sup>v</sup>, col. 1; CLM 647, fol. 11<sup>v</sup>) isti<sup>2)</sup> venti et venticuli inveniunt personas discoopertas propter calorem unde exalatio fit, venti subintrant per poros exalatos, et faciliter persone inde alterantur. De istis talibus vaporibus loquitur Averrois commentator et doctor noster frater Egidius super 2<sup>o</sup> de anima allegantes dicta Avicenne de prelio Troianorum et de cadaveribus.

Quinto caveant sibi a locis corruptis et fetidis propter malum aerem. Habeant cameras suas colerici in estate et in autumpno precipue in locis frigidis et humidis. Aspergant parietes et locum camere aceto vel aliis fumigationibus bonis ut docet Avicenna in rectificando aerem. Non teneant comestibilia nec talia unde aer posset infici quia aer continue attrahitur ab homine etc.

Sexto caveant sibi a stupis et a balneis specialiter colerici et martiales. Et si opportunum esset eis intrare balneum, non intrent nisi digestionem facta nec multum morentur. Non intendant capitibus discoopertis, nec statim bibant post balneum, quia frequenter expertum est quod febres vel frenesis tales invasit etc. (CML 647, fol. 11<sup>v</sup>.)

Septimo caveant sibi universi a repletionibus et a diversis cibis et precipue non usitatis, quia diversitas cibariorum arguit diversitatem operationum secundum naturales. Nam secundum Aristotelem et Averroem commentatorem eius in de celo et mundo, Substantia virtus et operatio se consequuntur etc.

Octavo caveant sibi a potatione serotina et diurna, quia serotina impedit digestionem et varias passiones inducit in

<sup>1)</sup> Complexiones in CLM 276.

<sup>2)</sup> Hi in CLM 647.

capite, diurna vero usitata illicite inducit tremulationem membrorum et debilitatem nervorum. Permittitur tamen quod in locis corruptis et ubi aer non est bonus quod persone bibant in mane unum ciphum vini et comedant aliquid cum vino, et intelligitur de personis que use sunt bibere vinum, et excluduntur pueri et mulieres et precipue que apte sunt ad prolem. Tales enim mulieres multum deberent cavere sibi a vino puro et a potatione inordinata etc. Nam vinum sumptum ut prelibatum est reprimit (CLM 276, fol. 89<sup>v</sup>, col. 2) coleram, prohibet malos vapores, roborat vires, et letificat animum, ut scribitur in quodam libello de regimine sanitatis.

Nono caveant sibi a sompno meridiano (CLM 647, fol. 12<sup>r</sup>) et specialiter colerici. Vadant ante aliquantulum tempestivius dormitum in sero vel dormiant in mane aliquantulum plus. Et si expediret dormitio eis propter aliquod accidens etc., non dormiant calciative; vapores pedum inde ascenduntur ad caput.

Decimo caveant sibi ne in mane nimis tarde comedant et in sero nimis tempestive, et specialiter in estate et in autumpno. Sit ergo ordo iste comedendo. In mane comedant hora tertia quia ab hora tertie gradu (?) colera accenditur, humidum radicale consumitur, et calor naturalis debilitatur, et appetitus deinde efficitur inordinatus in motibus suis etc. In cenis vero comedant cum sol vadit ad occasum. Comedant in mane melius quam in sero. Non comedant in sero brodilia<sup>1)</sup> et specialiter fleuma quia talia brodilia generant varias eruptiones. Sed comedant carnes assatas vel coctas in brodio cum agresto Martialis et Saturninus. Cum vero surgunt de mensa lavent sibi manus cum aqua simplici et deinde lavent sibi os de vino et postea bibant secundum exigentiam suarum (CLM 647, fol. 12<sup>v</sup>) naturarum et temperate. Vadant postea spatium per rivos aquarum et per viridaria. Adduntur cantinelle vel verba leta et sollatii, quia talia letificant animum et per consequens conservant sanitatem, ut scribit quidam libellus de regimine sanitatis. Addit Aristotiles in libro de secretis secretorum ad Alexandrum magnum. Cum homo surgit a dormitione pectinet sibi caput specialiter cum pectine de ebore. Pectinatio exalat vapores de capite. Deinde lavet sibi manus et faciem propter oculos etc. Addunt autem ulterius quidam dicentes quod non est bonum dormire in herbis ad temperiem (?) celi propter epar et splenem. Etiam summe cavendum est ne homo dormiat sub umbra arboris nucis quia umbra illa frigida est et (CLM 276, fol. 90<sup>r</sup>, col. 1) pestifera ut tradunt naturales. Cum vadunt visitando infirmos portant aliqua odorifera in manibus et specialiter rutam cum salvia et feniculo. Ulterius lavent sibi frequenter pedes cum aqua calida saltem semel in septimana etc.

Undecimo caveant sibi a leguminibus et specialiter a fabis

<sup>1)</sup> Prodilia in CLM 276.

quia secundum Serapionem (CLM 647, fol. 13<sup>r</sup>) in libro de simplicibus capitulo 94 (?) faba est cibus inflativus magis quam aliquis alius et tardioris digestionis. Et secundum Dioscoridem fabe generant ventositates et inflationes et sunt tarde digestionis et generantur ex eis humores mali. Caveant sibi ulterius ab esu caulium quia caules secundum Serapionem in libro preallegato capitula 32 dicit. Et caules quidem desiccant sicut lentescunt et per hoc inducunt tenebrositatem visus. Et in quodam libro de proprietatibus rerum scribitur dicens. Quia caules sunt frigidi et sicci in 2<sup>o</sup> gradu generant inquam turbidum sanguinem et melancolicum. Permittitur tamen brodium caulium stipticis et hoc pingue<sup>1)</sup> quia laxativum et medicinale dicitur.

Duodecimo caveant sibi omnes in omnibus regionibus qui habuerunt matrem in suis nativitatibus in sexta domo quia tales fere quassabuntur variis infirmitatibus. Caveant sibi ulterius illi qui habuerunt dictum matrem in sexta domo suarum nativitatum quia illis accidet mors secundum astrologos, et diversificaretur mors in hominibus ratione martis (CLM 647, fol. 13<sup>r</sup>) ex aspectu bonorum et malorum planetarum. Perlegantur super hoc libri iudiciorum et nativitatum, et specialiter liber magnus ipsius Haly et liber aomar et Abohali. Et in illis libris dantur cause quare unus suspenditur et alius decapitatur, quare unus submergitur et alius moritur in lecto etc. Remove hic, bone christiane, intellectum tuum a libris iudiciorum ipsorum philosophorum et astrologorum, quia talis diversitas mortis magis provenit forte propter peccatum hominum vel propter reluctantiā iustitiæ divine, ut videtur innuere beatus Augustinus. Noli ergo credere tales effectus procedere ex constellatione quia talia possunt<sup>2)</sup> impediri ex parte materie. Et licet hoc sit difficile (CLM 276, fol. 90<sup>r</sup>, col. 2) non tamen est impossibile quia sapiens dominatur<sup>3)</sup> astris secundum Ptolomeum. Attendant hic medici dicta circa istud capitulum quid dicant Haly commentator et almansor in suis libris. Nam Haly in libro magnorum iudiciorum parte 5 capitulo 12 dicit. Quicumque habuerit in eius nativitate martem et venerem in sexta domo erit phisicus sapiens intelligens. Et Almansor magnus medicus et astrologus in libro (CLM 647, fol. 14<sup>r</sup>) nativitatum capitulo 23 dicit. Perfectus medicus erit cui mars et venus fuerunt in sexta domo. Sed planum est per tabulas alfonistarum patet quod mars fuit in sexta domo in revolutione anni et venus in quinta, ergo. Ulterius sub marte secundum astrologos continentur milites duces medici etc. Provideant ergo sibi et aliis.

Hic fuit data una glosa per quendam peritum medicum et astrologum dictis Haly et Almansoris atque dictis meis quod

<sup>1)</sup> In place of the four words here following caulium CLM 276 has pingue stipticis.

<sup>2)</sup> Possint in CLM 276.

<sup>3)</sup> Dominabitur in CLM 647.

dicta debent intelligi de medicis famosis. Mihi vero videtur quod tantum debet intelligi conclusio de illis qui habuerunt martem in sexta domo quantum ad infirmitates vel in sexta domo quantum ad mortem. Et ista videtur intentio omnium astrologorum, et hoc de secundo principali.

Sequitur tertium principale ubi declaratur quibus rebus sit utendum et quibus non in comestibilibus. Et continet conclusiones seu capitula, ut melius dicam, sex. Nam in primo capitulo declaratur quibus carnibus gradientium sit utendum et quibus non. In secundo capitulo declaratur quibus interioribus (CLM 647 fol. 14<sup>v</sup>) extremitatibus et partibus animalium sit utendum. In tertio capitulo declaratur quibus volatilibus et quibus extremitatibus volatiliis sit utendum. In quarto capitulo declaratur quibus piscibus sit utendum et quibus temporibus. In quinto capitulo declaratur qualiter ovis sit utendum et quibus ovis. In sexto capitulo declaratur qualiter sumendus erat caseus. Composui supradicta sex capitula ex libris et ex radicibus Ypocratis, Galieni, Avicenne, Serapionis, et ex dictis quorundam antiquorum et modernorum assignando proprietates in gradibus dictarum rerum comestibilium. Ad presens relinquo vobis intimarum (?) ista capitula cum ratione prolixitatis verborum tum etiam ratione et reverentie medicorum et precipue (CLM 276, fol. 90<sup>r</sup>, col. 1) magistrorum Odorici et Iordani. Nam libri eorum sufficienter tradunt talia. Et tantum de tertio principali.

Sequitur quartum principale ubi declaratur qualiter medicus habeat providere in variis accidentibus concurrentibus sano et egro. Et continet quatuor capitula. In primo capitulo declaratur (CLM 647, fol. 15<sup>r</sup>) qualiter medicus debeat providere in minutione sanguinis per fleubothomiam et per ventosas. In 2<sup>o</sup> declaratur in quibus temporibus seu constellationibus debeat medicus dare potiones et purgationes etc. In 3<sup>o</sup> capitulo declaratur qualiter se debeat habere in medicaminibus constipatus. In quarto capitulo declaratur qualiter se debeat habere in sternutationibus gargarismis et vomitibus<sup>1)</sup> propter potionem vel per quodcumque aliud.

Quantum ad primum dicendum secundum Haly electionum horarum in minutione sanguinis etc. Oportet in hoc quod luna sit in defectu sui luminis et sit in signo masculino.<sup>2)</sup> Sit etiam iuncta marti. Nec est timendus mars nisi sit ascendens in latitudine et in circulo sue augis, sitque domus lune aspiciens illum aspectu laudabili. Et dixit quidam quod cavendum est in hoc a Tauro et a leone. Et dixit ulterius quod si modicum necesse fuerit minui de sanguine luna sit in libra vel in scorpiione. Et cavendum est ne luna sit in coniunctione mercurii vel saturni etc. Pre omnibus cavendum est (CLM 647, fol. 15<sup>v</sup>) ne

<sup>1)</sup> Virtutibus in CLM 647.

<sup>2)</sup> Figura masculina in CLM 647.

luna sit in signo geminorum quia secundum Ptolomeum aut minutio geminaretur aut membrum inficeretur et interdum homo moritur: experientiam vidi oculis meis. Etiam cavendum est ne ascendens sit signum geminorum. Apta ergo martem et lunam in talibus quia secundum Albumasar Mars est infortunatus in omni opere nisi in hiis que pertinent ad sanguinem et ad apertionem venarum etc. Alkindus dicit in minutione sanguinis etc. necesse est ut sit luna et ascendens in signis aereis et igneis et domini eorum. Nec tangendum aliquod membrum dum fuerit luna dominus domus ascendentis in signo quod habeat illud membrum (CLM 276, fol. 90<sup>v</sup>, col. 2). Laudamus quoque ut sit dominus medii celi fortuna aspiciens lunam vel domum ascendentis et luna non sit in decima domo. Aerea signa meliora sunt post preventionem. Minutio quoque et in initio mensis laudatur. Cavendum est tamen a coniunctione domini octavi cum luna etc. Perlegantur libri Haly de electionibus horarum super hoc.

(CLM 647, fol. 16<sup>r</sup>.) Quantum ad secundum, scilicet in purgationibus dandis dic secundum Haly libro preallegato quod oportet cum hoc fecerimus ut luna sit in ultima medietate libre vel in prima facie scorpionis sitque dominus eius fortunatus et fortis, et similiter dominus ascendentis. Bonum est etiam ut sit ascendens aliquod de illis signis vel aliud quodlibet ex signis inferioribus. Bonum est ut sit luna in hiis. In signo autem significante id membrum sit fortuna fortis. Et si voluerimus cum illo medicamine calefacere vel infrigidare, desiccare vel humidare, sit luna et ascendens in signo significante illud.<sup>1)</sup> Et caveas ne sit aliquis ex significantibus nec ascendens in signis ruminantibus quia talia signa significant vomitum.. Et dixit quidam quod ex omnibus iii<sup>2)</sup> signis ruminantibus solus capricornus est odiosus. Cave et precave tibi, bone medice, a saturno et a marte in dandis potionibus quia saturnus constringit medicinam, Mars vero ducit usque ad emissionem sanguinis etc. Perlegatur liber Haly etc.

(CLM 647, fol. 16<sup>v</sup>.) Quantum ad 3<sup>m</sup> dic quod in medicinis constipativis summe cavendum est a marte. Perlege super isto capitulo librum Haly commentatoris. Cavendum est etiam a signis ruminantibus etc.

Quantum ad 4<sup>m</sup> dic secundum Haly in libro ut supra. Oportet illum qui voluerit uti aliquod ex istis ponat ascendens et lunam et locum significatoris ex signis ruminantibus. Dicit Accabarus quod luna sit minuta lumine et cursu ascendens in circulo augis. Dicit Achait quod luna sit et ascendens in cancro vel leone vel virgine etc. Hic fuit facta obiectio per medicum

<sup>1)</sup> etc. in CLM 647.

<sup>2)</sup> The character in the MSS. looks more like ii, n, or ll, but probably the ram, bull, and goat are the "ruminating signs".

quomodo posset medicus talia observare. Re- (CLM 276, fol. 91<sup>r</sup>, col. 1) spondeo quod cautus et peritus medicus potest in maiori parte servare et specialiter in sanis, etiam in infirmis, hoc supposito quod cognoscat principium egritudinis infirmi et sciat cursum planetarum ut tenetur scire medicus, ut probatum est in quarta conclusione primi principalis secundum intentionem Ypocratis et Galieni. Ulterius fuit obiectum quod expedit aliquando quod fiat evacuatio statim etc. Mirabile est si expedit et se dimisit veni- (CLM 647, fol. 17<sup>r</sup>) re ad ultimam necessitatem propter ignorantiam vel imperitiam. Fiat quia necessitas non habet legem ut frequenter est allegatum. Et hoc de quarto principali.

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Advice from a Physician to His Sons

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## ADVICE FROM A PHYSICIAN TO HIS SONS.

The following very human document in the shape of a letter from a physician of Valencia in the Spanish peninsula to his two sons, studying at Toulouse, has seemed to deserve publication. It throws light upon such homely, daily matters as food, clothing and costume, both for summer and winter, day and night. It gives illuminating details as to personal hygiene, and suggests the error of the view that, because the mediaeval universities did not build stadiums, indulge in intercollegiate athletics, or institute departments of physical education, therefore the mediaeval student took little or no exercise. It illustrates both student and family life, our fourteenth-century father being even more solicitous that his boys keep out of draughts and wear sufficiently warm clothing than a modern mother would be. It is naturally of much medical interest for its particular prescriptions of drugs and medicines as well as its counsels of hygiene and preventive medicine. By its insistence upon personal cleanliness and its advice to select lodgings removed from all foul smells of ditches or latrines, and insistence on the importance of breathing pure air, it confirms my contention made in a recent article<sup>1</sup> that the Middle Ages have been unjustly represented as normally unsanitary.

Rather surprising is our physician's statement that about six hours of sleep a day is enough, especially in the case of two growing boys, and also centuries before development of artificial lighting beyond the candle stage had made staying up late at night a temptation. But if the fourteenth century youth at Toulouse had no cinemas or 'great white way' to seduce him from early retiring, study at night appears to have been at least as common then as now. It is true that the sons may have been at taverns or on the streets when the father thought of them as occupied with evening studies. However, he does not object to their 'enjoying themselves with their friends.'

The letter also seems of some linguistic importance, since a number of words of an unusual sort, difficult to translate exactly, or to find in existing mediaeval Latin dictionaries, are used for herbs, drugs, contemporary articles of clothing, and other things in common use. Thus we find *libellus* employed in the sense of a small stove, oven, or heater. Moral and religious counsel are not given to the extent that many would expect from such a mediaeval letter, but a tactful word on the subject is inserted under the heading, 'Of accidents of the soul'. But perhaps the chief service of our treatise is to make us feel that we are dealing with actual persons, to take us back with vivid versimilitude into the fourteenth century, and to drive

<sup>1</sup> 'Sanitation, Baths, and Street-cleaning in the Middle Ages and Renaissance.' *SPECULUM*, III (1928), 192-203.



home the conviction that the men of that period were not very different beings from those of today. Prescriptions have changed more than physicians, and curricula have altered more than students, while the danger of coughs and colds remains about the same.

The letter occurs in a fifteenth-century membrane manuscript of the British Museum, *MS Sloane 3124*, fol. 74<sup>r</sup>–77<sup>r</sup> (old numbering, fols. 82<sup>r</sup>–85<sup>r</sup>). The manuscript once was at Montpellier, where it formed a part of the library of Franciscus Ranchinus. It contains somewhat more than three hundred and fifty leaves, and its contents are largely medical. Our letter, as it is found in this manuscript, is evidently a copy and not the original, being in the same handwriting as medical treatises of other authors which precede and follow it. Indeed, a work of Arnold of Villanova begins on the same page on which our letter leaves off. Our treatise is dated 1315, and while there is evidence that the copyist at first wrote, or started to write, 1415, the earlier date seems the more acceptable. Toulouse was threatened with war in 1415, and most of the works which compose the present manuscript are of thirteenth- and fourteenth-century authorship or translation.<sup>1</sup>

While our physician is said to address his two sons, his advice—at least in the copy of it which has reached us—seems to be addressed to one recipient for whom the second person singular is employed. This may be because it has come to be thought of as meant for an indefinite general reader or member of a student body. In connection with our physician's name, Peter Fagarola, as it appears to be spelled in the Sloane manuscript, it may be noted that a Bernard Figarola was *médecin de chambre* at the court of Aragon about 1387.<sup>2</sup> Possibly they were of the same family. The text follows; a translation will appear in *Annals of Medical History*.

MS. SLOANE 3124, fol. 74<sup>r</sup>–77<sup>r</sup>

Sequitur Regimen conditum a Petro Fagarola<sup>3</sup> in artibus et in medicina magistro quod ab ipso fuit missum a civitate Valencie ad civitatem Tholosanam duobus filiis ipsius studentibus in ipsa civitate Tholosana degentibus anno domini millesimo CCC<sup>mo</sup> 4 X<sup>o</sup> quinto.

De Cibis seu in Modum Cibi, etc.

Caveas nimium et frequenter comedere presertim in nocte. Vita comedere cepas crudas nisi raro quia ebentant intellectum et omnes sensus.

<sup>1</sup> The latest definite date of authorship appears to be September 23, 1393, for a treatise on the pestilence made by the counsel of the medical faculty of Bologna and written by Gandolphus of Padua. It occurs at fol. 51<sup>v</sup>–61.<sup>v</sup> But possibly the *Practica mag. Philippi Alanfancii Englici*, fol. 196<sup>v</sup>–220, opening, '*Cura effimere ex oppillatione . . .*' is a later work.

<sup>2</sup> Luis Comenges, 'Contribution à l'étude de l'histoire de la médecine dans le royaume d'Aragon,' *Janus*, VIII (1903), 523–529, 574–582: page 528.

<sup>3</sup> Fagraola, Fagraiola, and Fagaiola are other possible readings.

<sup>4</sup> There seems to have been an erasure here; perhaps CCCC was written first and then altered to CCC<sup>mo</sup>.

Vita omnia lactissima sicut lac et caseum recentem nisi raro presertim. Caven-  
dum est in eadem mensa lac comedere et pisces vel lac et vinum etc., nam lac cum  
piscibus vel lac cum vino generant lepram.

Porcum recentem non nimis frequentes; porcus salpressus<sup>1</sup> bonus est etc. Non  
multas nuces comedas nisi raro et post pisces. Idem dico de carnibus et fructibus,  
nam dure et male digestionis sunt.

Potus tuus sit bis vel ter vel quater in mensa. Extra mensam raro bibas nam me-  
lius esset in mensa semel superfluere quam extra mensam bibere. Non vinum sine  
aqua, et si nimis sit frigida, calefac eam in yeme. Malum est enim assuescere vinum  
forte sine commixtione aque.

Recordare de aqua putei Tholoze quare coqua<sup>2</sup> cum aqua Garone quia male aque  
sunt Tholoze.

Item postquam surrexeris a mensa ablue os (fol. 74<sup>v</sup>) cum vino. Hoc facto cape  
unum cloquear istius dregete. Recipe carni preparati cum aceto et exicati coriandri  
similiter preparati ana modicum; assatorum seminis feniculi eufrazie florum albi  
albi ana ʒ ii; coriandri conditi anisi confecti liquirissee rase ana ʒ i et β; gariofli  
mastis cubebe ana ʒ iii; galange cardamomi ana ʒ ii; zinziberis albi ʒ vi; zuccari  
panis albi ʒ iii.<sup>3</sup> fiat dregeta que ponatur in massapano. Et istam teneas in camera  
in loco secreto [secco?], confortabit enim tibi digestionem caput visum intellectum  
et memoriam et deffendet a reumate.

#### De Sompno.

Sompnus sufficiens et naturalis est dormire per quartam partem diei naturalis  
aut parum plus aut minus. si aliter fiat, pervertit naturam. peccant superflua,  
quare cave nisi sit casus urgens et necessarius.

Cave dormire ressupinus nisi raro, enim multa incomoda parit. sed sompnus tuus  
sit in latere aut super ventre et primo super latere dextro deinde super sinistro.

Non dormias in yeme cum pedibus frigidis sed primo eos calefac ad ignem vel  
ambulatione aut aliter, et in estate non dormias sotularibus<sup>4</sup> calsiatis quia prolaben-  
tur fumositates que cerebro et memorie valde obsunt.

Non dormias statim ventre repleto sed post horam a cibo sumpto. nisi sit preur-  
gens necessitas etiam post cibum sumptum ambula (fol. 75<sup>r</sup>) modicum saltim per  
carreriam ut cibus dessendat ad fundum stomachi et ne in ore stomachi supernatet,  
quoniam effumat ad caput et repletur reumate et memoriam subripit et amputat.

Item cave iacere in loco reumatico ut puta in domo infima vel subtaranea (*sic*).

<sup>1</sup> For *salpetrus*?

<sup>2</sup> A sign above the *q* would indicate that other letters (probably *er*) should be inserted,  
but it appears superfluous.

<sup>3</sup> Regarding these signs of apothecaries' weights we read in our same manuscript (*Sloane*  
3124, fol. 66r) at the close of the pest tractate of John Jacobi:

'Ad evidenciam ponderum est notandum quod in libri sunt quatuor quartaroria, in quar-  
tarorio quatuor ʒ. In uncia sunt VIII<sup>vo</sup> ʒ et in drama sunt tres ʒ. In scrupulo sunt XX<sup>ti</sup>  
grana. Item aureus solidus et exagium (?) sunt idem et est pondus ʒ i et β. Item sestarcium  
est librorum ii et β.'

<sup>4</sup> Ducange, however, in defining *sotulares* or *subtulares*, says, 'Pedulium genus, quibus  
maxime Monachi per noctem utebantur in aestate.'

## De Aere vel Continente

Elige hospicium ab omni fetore segregatum ut puta valli aut latrinarum et similia, quoniam aerem et anelitum continue atrahimus qui, si infectus est, inficit nos plus et fortius quam cibi et potus corrupti.

Item in yeme camera tua sit clausa ab omni vento nocivo et habeas paleas in pavimento ne frigiditas ledat te.

Item si potes habere carbones vel ligna frustatim siza in libello lutato de bono luto, vel caminea et ignem in camera teneas, bonum est.

Item sis bene indutus bene calciatus et per viam habeas patiscia ut pedes habeas calidos.

Item non facias tibi pileum de salsamentis (?) ut quidam nam nocent.

Item cum videbis alios studentes portare capucium inductum et tu fac similiter et si opus est foleratum.

Item de nocte dum studes debes tenere super capucium buretum et super genas (fol. 75<sup>v</sup>).

Item cum vis dormire de nocte teneas unum berretum album in capite et sub genis et alterum de colore desuper. oportet enim de nocte calidius servare caput quam de die.

Item tempore magnarum pluviarum bonum est portare per viam super capucium unum berretum vel galerum idest capellum ne caput balneatur. ymo etiam quosdam (portare?) buretum super capucium tempore cereno et magis cum frigore ut coram magnatibus buretum removentes scuzentur ne capucium deponant.

Item serva tibi caligas et pedes non sinas fieri sordidos.

Item ablue caput si assuetus es abluere saltim de xv in xv diebus cum lexivo [lixivio?] calido et in loco clauso a vento in vespere festi iuxta noctem. deinde excica capillos cum manutergio fortiter fricando. post liga, deinde buretum vel capucium apponas.

Item pectina tibi caput singulis diebus si velis mane et vespere ante cibum vel saltim post si aliter non potes.

Item cave ne ventus per fenestram vel foramen invadat te dum studes vel dormis ymmo omni hora. nam latenter invadit homines.

Item in (e)state si non vis habere pulices vel non plures, singulis diebus cameram munda cum scopis et eam cum aqua non irrigabis nam ex pulvere humido generantur, sed interdum cum (fol. 76<sup>r</sup>) aceto forti irrigabis quod etiam cor et cerebrum confortat.

Si velis cotidie aliquem locum ambulare mane et vespere fac, et, si est tempus frigidum, si potes currere, ventre vacuo curre, vel saltim festinanter ambula, ut calor naturalis vivificetur. Ignis enim cito scingitur si non commoveatur vel eventetur. Ventre tamen pleno non est currendum sed suaviter ambulandum ut cibus ad fundum descendat stomachi.

Si non potes extra hospicium excitari aut quia tempus non patitur aut quia pluviosum, assende ter vel quater gradarium festinanter et in camera bacculum ponderosum grossum ut gladium habeas et modo cum una manu modo cum alia quasi sgrimando moveas donec fere fatigis, hocque plurimum valet ad calefaciendum et fumositates per poros egrediendum et alias superfluitates consumendum. Similiter saltare exercitium est, eciam cantare est exercitium pectoris, et si hoc feceris habebis membra sana, intellectum sanum et memoriam, et vitabis reuma. Similiter ludus pile. Omnes hii inventi sunt non pro ludo sed exercicio. Labor autem nimius est vitandus in continuo usu.

## De Accidentibus Anime

Accidencia anime maximam habent ut ira tristitia et amor mulierum timor nimia solli(cit)udo, de quibus omnibus nil amplius dico nisi quod vites omnes passiones anime tibi nocivas et leteris et gaudeas cum amicis et bonis et (fol. 76<sup>v</sup>) diligas honestatem et pacienciam que magis afferunt animo delicias et maxime si deum toto corde diligas.

## De Tussi

Si tussis infestat te caveas ab omnibus frigidis et acetosis, a salsis et frixis. Et si sit causa tussis reuma frigida, tunc fiat saculus de milli(?) sale calamenti ana missis ter in simul, et fiat saculus cadratus qui calidus ponatur supra summitatem capitis aut supra comissuram. Et in ore teneatur unum parvum frustum liquiris rase qui masticetur inter dentes aut dregeta facta de liquiricia. Similiter confert sirupus de capillis veneris, sirupus de ysopo, sirupus borraginis, si sumatur cum aqua scabiose aqua lilii aqua sambucis aqua betonice aqua anthos ana vel fiat gargarismum tepidi in ore. Similiter confert dyera yeris Salamonis diapenidion dyagragantum frigidum conditum penidiarum grana pini et similia. Item si tucis sit cum reumate calido de quo sunt signa perfecta calor ardor in gula et salsedo magna sitis, in hoc sumatur diagragantis frigidi aut diapenidii sine speciebus cum sirupo violato vel sirupo de papavere. et hoc sumatur lanbendo non subito transgluciendo, et hoc fiat sine quacumque comestione mane et sero. Post ea immediate recipe pannum lineum subtile et in oleo rose tepido extingatur et tepidus supra comissuram capitis aplicetur et hoc fiat bis in die.

Item in reumate (fol. 77<sup>r</sup>) frigido caveat ab omni brodio et offis quantum possibile est et a potu superfluo. Sed comedat omnia assa non in aqua lixata et comedat omnia cibaria spissa ut risum et fabba fracta a cortice mundata et similia cum carnibus conditis.

Item in reumate calido comedat ordeatum amidum avenatum conditis cum lacte amigdalorum et zucarría pira et poma cocta cum zuccaria que etiam valent in reumate frigido. Item potetur vinum citrinum clarum et bene linphatum. Item similiter valet in hoc casu diagragantum frigidum diapenidion sine speciebus zuccarum violatum conditum penidiarum et similia. et hoc sufficiat quantum est de reuma.

EXPLICIT DEO GRATIS AMEN AMEN.

LYNN THORNDIKE,  
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SOME LEONINE SUMMARIES OF GEOFFREY OF  
MONMOUTH'S HISTORIA REGUM BRITANNIAE  
AND OTHER POEMS

THE Bibliothèque Municipale at Douai, France, has a fine collection of manuscripts. Among them are to be found two, which contain, in addition to other works, Geoffrey of Monmouth's *Historia Regum Britanniae*. They are numbered 880 and 882, and both belong to the end of the twelfth century. I shall refer to MS. 880 as *D*, and to MS. 882 as *D*<sub>1</sub>.

These two MSS of Geoffrey deserve consideration, because they contain material not found in thirty-six other MSS of Geoffrey which I



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Rufinus: A Forgotten Botanist of the Thirteenth Century

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## Rufinus : A Forgotten Botanist of the Thirteenth Century

The botany of the middle ages has commonly been held in low esteem. The illuminations in the manuscripts of the PSEUDO-APULEIUS and other medieval herbals have been criticized as creations or copies of the artist or as his faulty reproduction of previous traditional illustrations which originally bore some resemblance to reality. So that, much as GIBBON viewed the history of the middle ages as the decline and fall of the Roman empire, historians of science have regarded medieval botany as little more than the decline and fall of DIOSCORIDES. If EMILE MÂLE, from his study of Gothic cathedrals, called attention to the accurate knowledge and faithful reproduction in stone of the flora characteristic of each locality, this was set down to the credit of the genius of the Gothic sculptors, though MÂLE himself had demonstrated how closely in other respects the medieval artists adhered to or paralleled the literature and learning of their time. As if a sculptor would know flowers better than a professional *herbarius* or herbalist would ! MEYER, it is true, in his history of botany lauded highly ALBERTUS MAGNUS who had developed ALFRED OF SARSHEL's translation of the scanty two books of the PSEUDO-ARISTOTLE on plants into the seven books of his *De vegetabilibus et plantis*. But this estimate of ALBERTUS as the greatest figure in the history of botany between THEOPHRASTUS and CESALPINI rather distinctly implied that there was no one like him in the long intervening period. Of late years, however, more attention and study has been devoted to medieval botany, and such a recent book as HERMANN FISCHER's *Mittelalterliche Pflanzenkunde* assembles much valuable material from manuscripts as well as printed works.

Yet I shall now call attention to a medieval botanist whose

work and personality appear hitherto to have remained unknown to modern investigators. His name does not appear in the index of *Mittelalterliche Pflanzenkunde*, but FISCHER, in listing after DE TONI (1) the citations in the *Herbarius* of BENEDETTO RIVIO early in the fifteenth century, notes that a RUFINUS is frequently cited and that he was probably VALGIUS RUFUS, author in 12 B.C., according to GALEN, of a didactic poem *De herbarum virtutibus*. (2) Such far-fetched resuscitation of a classical author is not necessary : we must look nearer home. The RUFINUS whom RIVIO cites undoubtedly was the author whose work I have found and which was composed by him not long after the death of ALBERTUS MAGNUS. In fact, he seems ignorant of the existence of *De vegetabilibus et plantis* which he never cites, and which there is no evidence that he plagiarized. On the contrary, many of the herbs treated by RUFINUS are not included by ALBERTUS, and, when the same plant is discussed by both, it is in quite different style.

RUFINUS apparently was an Italian. He is also called a holy doctor, but this seems less likely. In his prologue he tells us that he had studied the liberal arts at Naples and Bologna. He specialized first in astronomy and then, turning from superiors to inferiors, decided to examine fully and perfectly the science of herbs. The results of his researches are preserved in a large and handsome folio volume of some 118 leaves, written with red and blue initials on membrane in double columns, except the first sixteen leaves which are devoted to an index written in three columns. Formerly in the possession of Lord ASHBURNHAM, it is now in the Laurentian library of Florence. (3) This is probably not RUFINUS' autograph but a fourteenth century copy. The title of the work is, *Of the Virtues of Herbs and of their Compositions*. (4) At first glance it might pass for a mere compilation

(1) ETTORE DE TONI, "De libro dei semplici di Benedetto Rivio," *Memorie della Pontificia Accademia Romana dei Nuovi Lincei*, vols. 5, 7, 8 (1919-1924).

(2) FISCHER, *Mittelalterliche Pflanzenkunde*, Munich, 1929, p. 230. (*Isis*, 15, 367-70).

(3) Ashburnham 189 (121).

(4) *Ibid.*, fol. 17r, col. 1 : rubric, "Incipit liber de virtutibus erbarum et de compositionibus earum compilatus per sanctum doctorem magistrum Rufinum de dictis summorum phylosophorum Diascoridis, Circa Instantis, Macri, Alexandri, Salerni (magistrorum), Ysaac et quamplurimum aliorum doctorum"; incipit,

from previous authorities, primarily medical. RUFINUS himself gives this impression in the prologue, saying, "And I have collected from the sayings of the ancient sages describing the virtues of the herbs and their workings in inferior bodies according to what they had experienced and the truth they were able to find concerning these. And first I quote the words of DIASCORIDES, second *Circa instantis*, third MACER, fourth ALEXANDER THE PHILOSOPHER, fifth the masters of Salerno, sixth ISAAC, seventh the *Synonyms*." This is assuredly a program which promises nothing either original or even up-to-date in RUFINUS' work. And at first sight he appears to adhere to it faithfully. He occasionally cites other authorities than the seven listed. COPHO and PLATEARIUS will perhaps fall under the head of masters of Salerno, but ROGERIUS and a master WILLIAM are also cited, not to mention GALEN, PTOLEMY, and JOHANNITIUS. These variations, however, are comparatively unimportant.

But presently we observe that, after the authors have been cited, there come at the end of the treatment of the herb in question a few lines introduced by the word, RUFINUS. Or sometimes no authors at all are cited for an herb. Or the only name mentioned is RUFINUS. And finally we realize that many herbs are discussed which were treated not merely by only one or two of the seven authorities, but which had not been mentioned by them at all. It is in these modest additions to his authors and the filling in of gaps where authorities were totally wanting that RUFINUS' contribution to the science as well as to the literature of botany consists.

The medieval literature on herbs has hitherto been represented as subordinated to pharmacy. Herbs, we have been told, were valued for their supposed marvelous healing properties and not studied *per se* and for their own sake. It is just this assumption that the work of RUFINUS contradicts. For precisely what his additions to his authorities consist in is careful detailed description of the plant itself, its stalk, leaves, and flower, painstaking distinguishing of different varieties of it, or differentiation of it from or comparison with other similar or related flora. He also is careful to inform us as to other names applied to a given

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"Cum emereris ineffabilis virtus corpus perfectum nec in aliquo diminutum scilicet mundum disposuerit..."



herb, or other plants indicated by the same name, so that his work, if rendered available by publication, would constitute a most useful work of reference for those having occasion to deal with the vexed question of the medieval names for herbs.

But it is the descriptive side of RUFINUS' botany that I wish especially to bring out here, and this may be best and most faithfully done by reproducing a number of his passages which were selected practically at random, omitting many others. It will perhaps also be most convenient in reproducing them to maintain his own alphabetical—or nearly so—order. I leave the names of the herbs in Latin as RUFINUS gives them. His very condensed language at times makes translation difficult and the abbreviated writing of the manuscript sometimes leaves the spelling of the name of a plant in doubt.

RUFINUS's addition to what his authorities have said of *aristologia* is as follows : " The long *aristologia* has long pointed leaves and a yellow flower and long root. The round *aristologia* has round leaves and a black flower and a round apple on its root. The fruit of both are called by the common people *terrumalium*. They hang from the branches. Or they are called *mellumcelli* by the same laymen." ALBERTUS, like RUFINUS' authorities, has an account of *aristologia* and mentions the long and round variety, but RUFINUS's own additions are not paralleled in ALBERTUS's work.

" *Auricula leporis*. It has a very thin little branch and at the top white flowers. Its leaves are like those of *acetosa* but much blacker and without fuzz. And if it is touched with the hand it is sticky and clinging. Its root is full of nodes, and close to the earth it has many leaves like the leaves of *salex*. And it is medicinal." ALBERTUS MAGNUS mentions *auricula muris* (mouse's ear) but not this hare's ear.

" *Aurigea duplex*. It is also called *paradella*. It grows so to speak everywhere. Its leaves are half a finger long and narrow like the leaves of *cauliculus agrestis* and are crenated. It has a very thick stem a cubit high and many leaves. Its white flower is on top only and is like the flower of *cottula foetida* in color and magnitude. Its seed is put in medicines. There is also another *aurigea* having one purple (*violaceum*) flower at its top. But note that the aforesaid *aurigea* with the white flower and

called *paratella* is wonderful beyond measure in curing cuts in one or two days. There is still another *aurigea*, as it is believed smaller. It is like *tursulum* but its leaves resemble the leaves of *tanavete* (*canavete* or *cavanete* or *tavanete* are other possibilities) and at the end of its branch are sometimes white flowers but not so large as those of the large *aurigea*." ALBERTUS included neither *aurigea duplex* nor the three following herbs.

"*Aucheta* is a shrub a cubit high with thick crenated leaves and many flowers purple and yellow at its summit. There is also another *aucheta* with which the earth is full, and it is like mountain *polium* in its leaves and is also called *sticados*. It grows in sandy soil and is also called the herb of St. Mary and *canusula*. And crushed in lye it dyes the hair a golden color if anyone washes it with that lye. Note that in many places *aucheta* is called *bethonica*. It too makes the hair golden as the women say."

"The herb *aucha* has a twisting stem (*facit gambam*—an Italian word frequently employed by RUFINUS—*ut volubilis*) and climbs hedges and trees. Its leaves are flat, not round nor curly, like the leaves of *fraxinus*.

"*Athanasia* has the other names *donageta* or *atanacetum*, that is, *matricaria* (or possibly, *matricis cura*). It grows in the midst of gardens, has a stalk a cubit high or more with five or six yellow flowers at the top. It is good for pain of the womb taken as food or drink."

Passing over several descriptions of herbs whose names begin with B which appear to be by RUFINUS since no other author is cited and which are not found in the *De vegetabilibus et plantis* of ALBERTUS, we come to camphor. RUFINUS describes it as a gum which will burn in water as bitumen does in oil, if it is placed on something light to support it on the water while it is burning. "So camphor burns on water and this I have proved and it is true." ALBERTUS had also discussed camphor but without noting this property of it. Instead he told how fond leopards were of the camphor tree and attempted to give an explanation why smelling of camphor checked sexual appetite in men but aroused it in women.

"*Caput galli* grows in the woods and is an herb with many branches and black leaves. Another kind with white leaves is feminine and thin and has stems grouped in squares [or, by fours].

The flower of this herb is marvelous to see because it is the length of a finger making four acute angles and on each side has a round concavity and is, like a pine, large at the bottom and sharp at the top, and above the angles issue florid tongues in all directions, and the leaves which are beneath the flower are turned towards the earth. And it does not grow beyond a cubit, and in it are many secrets. Moreover, there is another similar to that herb in leaves and flower which is called dragon's head (*caput draconis*), but its flower is red or purplish, and it emits little yellow flowers from the large flower." ALBERTUS does not treat of either the cock's head or dragon's head.

"The stem of *centaurea maior* is round, shiny (*lucida*), and very green : The leaves are like those of *mater silve* though small, and the stem goes through the middle of each leaf, and between successive leaves there is a space of four inches, and at the top of the stem are many yellow flowers. The height of the stem is about a cubit, and its taste is very bitter, but in its flowers are eight very yellow leaves."

"There is also a *centaurea media* of which the above cited philosophers make no mention, and concerning which all the herbalists of Bologna and Naples were in agreement. But perhaps the aforesaid philosophers classed the medium with the minor as a single variety, because those two have a certain similarity in leaves and flowers. Nevertheless this *media centaurea* has many stalks on a single root and has leaves like *majorana*, and the leaves are three fingers apart and are sharp and narrow, and two little branches go out of two leaves, and at the top are many little purple flowers."

"*Centaurea minor* grows during the last of May, and it has only one stalk on one root. Its leaves are like those of *centaurea media*, and its flower is of the same shape but smaller, white and purple for the most part like the *media*. And it is a tiny plant and acrid."

ALBERTUS who treats of the *centaurea* does not distinguish the *media* variety, but does say that there are two kinds of the *maior*, one green, and one yellowish in its stalk.

"*Coclearia* grows in fountains and very cold water. Its leaf is very glistening and is almost exactly like the leaf of the wide plantagenet in every respect." ALBERTUS omits it.

So much for a few selections from herbs beginning with the letter C. We have passed over *Caro manna*—possibly a corruption for *cardamomum*—to which a whole column was devoted, *Centumgumma* to which Rufinus devoted six lines, *Celidonia* where he added only two lines to his authorities, *Centrumgalli*, *Cinoglossa*, *Cicuta* where he added a half column of his own to a half column from his authorities, and *Cicer imperatoris* whose treatment was entirely his own. Most of these plants are not described by ALBERTUS MAGNUS.

Under D RUFINUS treats the same two herbs as ALBERTUS does but differently. He almost doubles in length the account of dittany and adds to nearly a page from authorities on *daucus* the statement that there are three kinds: “*Daucus asininus* and it is called *pastinata* and likewise *baucia*. And there is *daucus Creticus* which is called *cartuge* and there is another noble *daucus* which is called *affanaria*. Furthermore there is a *daucus* which is called *pastumcellus*. Its seeds cling to one’s clothes. It is given for cricks,—*detur pando* (?)” ALBERTUS has only four lines on dittany and his account of *daucus* seems limited to the Cretan variety.

As for Hellebore (*Elleborum*), “I, RUFFINUS, seeing that those herbs are deadly poison did not wish to treat of them as medicines and I have omitted the statements of the sages who spoke unduly of them and their medicinal properties because they cannot be used without danger of death.” As for the difference between *pes lupinus* and black hellebore: “Black hellebore has a round stalk and seven leaves on top, two leaves open inside cut in three and two simple leaves next these and three leaves after those two divided into three parts. Others call *branca lupina* what the Romans call *pes lupinus*, but it has ten leaves or nine, all simple, and has a hollow stem.” ALBERTUS treats of hellebore differently.

“The root of *enula* pulverized and put in wine gives the greatest relief to the nerves. Cooked in wine it helps paralysis. *Salvia* cooked in wine is also wonderful for paralysis. *Enula* has broad white leaves and a stem and flowers, and mandragora similarly but without the stalk. Furthermore a certain priest a hundred years old ate often and yet again of the root of *enula* both raw and cooked, and he saw as clearly as a boy, as master Antony

used to tell." ALBERTUS says nothing of this priest, nor is the rest of his account of *emula* identical.

We omit a slightly longer addition to Heliotrope (*Eleotropium*), pass over four columns on electuaries, a column on endive (*Endivia*) which seems to use no authorities, a column on *Esula* of RUFINUS' own and what a PETER DE CASTEIONO "told me in the kindness of his heart," briefer additions to *Eupatorium*, *Filipendula*, *Gita*, and a treatment of *Genuisse* which is all by RUFINUS, but note his addition to past accounts of gentian.

"*Gentiana* has leaves like *Sambucus* and at the top of each stalk has three leaves. Each leaf is divided into three parts and one division is higher than the other, and the leaves themselves are very fine in substance though broad enough. A gross gentian is brought from Verona, but the delicate variety grows round Bologna." This passage is quite different from ALBERT's paragraph on gentian, and he does not mention the next herb.

"The herb *lunaria* has a stalk almost three cubits high of azure color, and there are many nodes at distances of three fingers apart, and at each node are three leaves. It has occult properties of which I say nothing for the present. A certain herbalist told me that the herb *lunaria* has a root a span in length with three little branches, one at the head of the root, the other in the middle, and the other at the end, and all the branches are yellow. And on the first day of the moon each branch has one azure leaf, and on the second day of the moon two little azure leaves like *Turonensis grossa* or *Turonensis parva*. And so the leaves multiply until the fifteenth day, and afterwards one leaf falls off every day. Moreover, of the juice of its leaves if anyone drinks a dram, I have found that though a man be a hundred, he would return to the condition of thirty years."

After quoting three lines from the Salernitan Tables as to *Memith*, RUFINUS adds that he has found such disagreement concerning this herb that it leaves him in great doubt. AVICENNA says that it is *celidonia* which is hot in the fourth degree. And the Tables of Salerno say that *Memith* is cold in the second degree. "But it should be known that I, RUFINUS, have heard from a physician that the herb exists in great quantity in the sand of Rapallo and resembles black pepper in leaves and stems but is quite different in its flower. For whereas the flower of black

pepper is very delicate in its petals and is quite red, the flower of this herb called *Memith* is yellow of a wonderful hue. And this *Memith* has very delicate *theucas* (?) like those of *Fenugrecus*. The root of this herb is used in eye washes. Also the ninth Table of Salerno says that *Memith* is the same as *Celidonia agrestis*."

"*Millefolium* is called by other names : *Ambrosia* and Venus's eyebrow or also *Centonium*. It has a somewhat long stalk, its leaves are very minute like fennel or *Abrotanum*, its flower is white in a round crown like *Pastinaca*. We use its leaves. For its flowers kill worms because of their bitterness. Some of its flowers are white, some yellow, and some purple, and they are all in round crowns on the top of little branches like fennel seed."

"*Mirasolem* is the same as garden guard, *Pentadactylus*, *Girasolem*, and is an herb which has a high stalk like *atriplex* and seems almost a tree. Its leaves are round, reddish, and interceded as leaves of the vine or as the leaves of *Pes collumbinus* are interceded. It has a purple stem and very thick. Its seeds seem like the worms which in summer cling to dogs and beasts and are the size of beans and are commonly called *Resne* and can scarcely be pulled off the beasts. The leaves on its stem are large—as much as a span. It has a purple flower." None of these last three herbs is included by ALBERTUS.

"*Satyrion* by another name is called Patricide (*interfactor patris sui*). There are two kinds, the larger and smaller. *Maior satyrion* has on its root two testicles, one long and dry, the other green. It has broad leaves like *Plantago lanceolata* and has a ferule and on top it has flowers between white and purple. *Minor satyrion* is also called fox's testicles. It has a small ferule, long narrow leaves like the fingers of one's hand. Its flowers are pure and purple and are very azure. If the dry testicle was of the past year and the green of the present year, the dry one of the past year eaten or drunk in wine or spiced water extinguishes lust wonderfully, while the green one excites to sexual intercourse." ALBERTUS under *Satyrion* has simply a cross reference to *Apium silvestre* of which his discussion is quite different.

RUFINUS was not merely a student of herbs but a medical practitioner as a long passage in connection with the herb, *Paritaria*, shows. "A certain man who for twenty eight days had been in such pain near the right breast that he could scarcely speak

came to me and said that he had been suffering intolerable pain in the breast, and he placed his hand on the right side, and immediately I understood that it was the apostema called *peripleumona* which develops in the lung. And since the pain was partly before and partly behind, I had made for him two bags of woven material filled with fine *paritaria*, removing the stems, and with absinth and bran." RUFINUS had the bags boiled in water and white wine, and, after they had come to a boil three or four times, they were twisted tight and bound with butter and *dialtia* (?), one on the chest and the other on the back of the patient where he felt the pain. This process of heating in water and wine and anointing was repeated daily and twice at night until, after the fourteenth day or application, a big globule of humor began to appear where the bag had been placed on the patient's back. RUFINUS then made "a noble plaster" of cooked mallow root, meal of *fenugrecus*, linseed, yolks of hard boiled eggs, and butter. This was superimposed hot on a piece of cloth on the bubble of humor many times. "And as the apostema came to a head, I told the patient's brother to bring a barber who lanced the apostema and squeezed it out hard. And since the patient was poor he feared expense and made a spout of cane and stuck it on the head of the apostema, and pus came out with putrid blood to nearly the quantity of a large *senaverium* (?). And so he repeated putting the said plaster on thrice every day, and he was completely cured with such treatment and the said plaster in thirty-two days. And the sick man himself told me that the pus expelled from the said apostema amounted to a barrel and a half, yet he neither drank wine nor ate fat until he was fully cured and because he carefully observed the diet prescribed for him, all went well."

"Likewise for one who could not urinate I had made a bag of *Paritaria* and *Abrotanum* boiled in white wine, and it was put as hot as he could bear it on the thigh, and another bag similarly hot under the testicles between both buttocks near the point where the urine passes to the bladder, with the result that he who had been unable to urinate for three days voided four urinals full of urine between the third hour of the day and vespers. And so he who was almost dead by God's aid and the benefit of *Paritaria* and *Abrotanum* was completely cured."

"Moreover, I, RUFINUS, declare with God as witness that in 1287 from the Passover to the first of September with the aforesaid bags of *paritaria* and absinth and bran, doing as above stated and afterwards putting a maturative plaster on the painful spot as described, more than sixty-five men and women were cured in the aforesaid time. Some who had an apostema in the breast spit blood and pus from the mouth during the day. Others who had it in the intestines voided two basins of blood and pus on the stool. In other cases of apostemata in the spleen or lung, the *paritaria* which is *diaforetica* with absinth and bran made the said apostemata appear externally, and these were opened and they were cured. And in that year this type of infirmity was more common in women than men."

Some eight pages of RUFINUS' work are devoted to unguents, one of which gives us another glimpse of his medical practice. A patient had a badly swollen thigh, red and inflated, "and all the surgeons who saw the said thigh wished to cut into it." But RUFINUS forbade their doing so and cured the patient in three days with an ointment made of marble pulverized and mixed with honey. "And I proved this in many men and women."

Or RUFINUS recalls a case of another Italian medical practitioner. "Master MATTHEW OF GENOA gave RAYMUNDINUS CYDADA goat's milk to drink to move his bowels, and straightway two hours later he died. The leading physicians called into consultation said that the goat who gave the milk had eaten poisonous herbs. The same thing happened to NICHOLAS DE VOCTA in Genoa."

As his use of marble has suggested, RUFINUS' work is not exclusively limited to herbs and botany. He has chapters on bitumen and cement, telling how either is made, and a chapter on *Minium* stating its manufacture from lead. Eggs, the bone from the heart of a deer, salt, pearls, and tyriac are the themes of other chapters more medical or chemical than botanical. There even is a chapter on the wheel in which reference is made to the instrument called *sexta*, i.e. the sextant, and to the astrolabe, and to PTOLEMY's proving by it and the polar star that the circumference of the earth is 20,400 miles. (5)

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(5) In the chapter, "Rota," Ashburnham 189, fol. 95v, vol. 2, the figures go on confusedly: "probat THOLOMEUS quod circumferentia maris et terre est



Indeed, although writing primarily on herbs, RUFINUS cannot forget his earlier astronomical studies, as his chapters on Virtue and on the Zodiac bear further witness. In them he outlines the astronomical system of PTOLEMY and ALFRAGANUS and states that only one quarter of the earth's surface is dry land. But his botanical interest also appears in the chapter on virtue when he notes that God and the incorruptible stars have put in herbs and trees so many and so great virtues through the corruptible and contrary qualities found in them that human sense fails in contemplating them. For we see a great tree like a tower grow from a single little nut, "nay from only the very top of the fruit where there is a grain like a grain of wheat, and that grain has many coverings and in the midst of them is a point well nigh invisible whence the tree issues and grows."

Our quotations from RUFINUS have already indicated that he shared the medical superstitions of his day and the belief in marvelous occult properties and sympathetic magic, as when a root that looked like testicles was used as an aphrodisiac and anti-aphrodisiac. He had heard at Bologna from sages and herbalists that if a goat were fed for twenty-five days on the herb called eye of the sun or eye of Christ, its blood dried and used in food and drink would break and remove the stone in bladder or kidneys. But such notions are what we expect to find in ancient, medieval, and even early modern works. The belief in the power of goat's blood to break the stone and even adamant was of hallowed antiquity. ALBERTUS MAGNUS is equally credulous and, to our way of thinking, superstitious in his *De vegetabilibus et plantis*.

Such features of RUFINUS' work do not detract in the least from his careful, discriminating descriptions of the herbs themselves, of which we have reproduced here only a fraction by way of illustration and in which he seems superior to even ALBERTUS MAGNUS. RUFINUS also makes it fairly evident that this sort of botanical interest and knowledge was not peculiar to himself but was shared in to a considerable degree at least by the Italian

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viginti milia miliaria et quadraginta quinque milia nonagintaquinque miliaria," but at fol. 109r, col. 2, in the chapter, "Virtus," the distance is again given as 20,400 miles.

herbalists of his time. His independence and ignorance of ALBERTUS MAGNUS' *De vegetabilibus et plantis*, though he writes after 1287, also affords food for thought. ALBERT of course taught at Paris and Cologne, while RUFINUS studied at Naples and Bologna. But men and books both crossed the Alps with frequency and freedom in those days. However, we seem to have evidence of local study and knowledge of botany which may have been far more widespread and healthy than we think; and it even appears, shocking as this may be to those who have viewed medieval science as purely scholastic, that personal observation and experience sometimes exerted more influence than the literary tradition. RUFINUS does not know the *De vegetabilibus* but he knows plants, and that is a great deal better. Moreover, he professes only to give us a digest of seven previous authorities but he actually presents us with a wealth of personal observation of nature and clinical experience.

This being the case, why has this original and meritorious work of RUFINUS remained unread, unprinted, and neglected through the centuries, while corruptions of DIOSCORIDES and PSEUDO-APULEIUSES and MACERS have been multiplied and studied? Here would seem to be neither a survival of the fittest nor substantiation of the theory of modern progress. The answer may be partly that the world does not care much for originality or for precise detailed information, and that most historical investigators are prone to follow in one another's footsteps like sheep. Such human characteristics were especially marked during the period of Italian humanism or the so-called Renaissance with its dislike and disregard for much preceding medieval achievement and its harking back to the classical period as the fount of culture and learning. During this essentially retrograde movement, at least in the sphere of science, RUFINUS who had committed the additional crime of not using PLINY was probably shelved and forgotten. The early printers found a much larger sale for the little *Secrets* of ALBERTUS on herbs than for the *De vegetabilibus* to say nothing of RUFINUS. When a few quaint and crochety early moderns began to botanize, they were apt to forget even ALBERTUS or to treat him as exceptional and to represent themselves as the first since the ancients really to observe plants. But all we have to do is look about in the manuscripts, and the ghost of RUFINUS

himself rises to confront and confute them. Medieval art and story, medicine and surgery, have already been resuscitated and rescued from such aspersions. If we look a little further, we shall probably find a RUFINUS in nearly every field of human interest and endeavor. Why not? "Before your Agamemnons there were men."

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A Mediaeval Sauce-Book

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III. The emendation *X* to *\*Y* is probably not justified.

No. 4. Type 'Abc'. Examples from the *Lindisfarne Gospels*: *gefotad* to *\*gefetad*, *fatas* to *\*fetas*.

No. 6. Type 'aBc'. Example from the *Lindisfarne Gospels*: *næudæ* to *\*minige?*

No. 7. Type 'abC'. Example from the *Lindisfarne Gospels*: *hefid* to *\*heafod* or *\*heafud*.

IV. The emendation *X* to *\*Y* is certainly not justified.

No. 8. Type 'abc'. Example from the *Lindisfarne Gospels*: *clioppende* to *\*clyppende*.

In the actual editing of texts it would seem advisable to admit emendations of classes I and II<sup>1</sup> into the text and to exclude those of classes III and IV.

## A MEDIAEVAL SAUCE-BOOK

By LYNN THORNDIKE

THE author of the work or chapter on sauces with which we are here concerned was Maino de' Maineri, or de Mayneriis, a physician and astrologer of the fourteenth century. His native place appears to have been Milan, and he is sometimes called Magninus Mediolanensis.<sup>2</sup> He spent, however, some years at Paris, where his name is found in the university records from 1326 to 1336.<sup>3</sup> On April 3, 1331, pope John XXII permitted him, although married, to lecture in the medical school at Paris, where celibacy was as a rule imposed upon members of the faculty. Earlier in the same year, the faculty itself had named him as one of its procurators in a struggle against the chancellor. Maino was one of the many authors of pest tracts, although his was not composed during the first great outbreak of the Black Death but at some time after 1348.<sup>4</sup> He was a leading member of the group of medical astrologers at the court of the Visconti mentioned by Petrarch,<sup>5</sup> and in 1358 he composed a *Theory of the Celestial Bodies*.<sup>6</sup> His *De intentionibus secundis* had already appeared in 1329–30.<sup>7</sup> He, rather than Arnald of Villanova, appears to have been the true author of the *Regimen sanitatis*, dedicated to Andrea of Florence, bishop of Arras from 1331 to 1334, which was printed under both names,<sup>8</sup>

<sup>1</sup> Some editors might prefer to exclude emendations of Class II also.

<sup>2</sup> Notably in the early printed editions of the *Regimen sanitatis*.

<sup>3</sup> Denifle et Chatelain, *Chartularium universitatis Parisiensis*, II, i, 291, 341, 360, 663.

<sup>4</sup> R. Simonini, *Maino de Maineri ed il suo libellus de preservatione ab epydimia* (Modena, 1923), 48 pp.

<sup>5</sup> Ferdinando Gabotto, 'L'astrologia nel quattrocento,' *Rivista di filosofia scientifica*, VIII (1889), 396.

<sup>6</sup> Milan, *Ambros. E. 114. sup.*, 15th century, fols. 45<sup>r</sup>–64<sup>v</sup>: 'Et sic habet finem theorica corporum celestium ordinata et ad finem reducta anno domini 1358, 12 Ianuarii sole existente in fine capricorni et luna in principio piscium prope Iovem. Explicit theorica corporum celestium ordinata per peritissimum artium doctorem magistrum Maynum de Mayneriis civem Mediolani.' I owe this description of the manuscript to the articles of Rajna (see below), x, 96, 98.

<sup>7</sup> Seville, *Colomb. 5.6.12*, membrane, 14th century: 'Incipit tractatus de intentionibus secundis compositus in studio Parisiensi per magistrum Maynum de Mayn(er)is. . . . In primis deum testor cuius nomen sit benedictus. . . .' The work is dedicated to Tommaso di Saluzzo: see Rajna, *op. cit.*, x, 71, 75.

<sup>8</sup> Under the name: Magninus Mediolanensis, at Louvain in 1482 and 1486; Paris, 1483; Basel, 1493; and once without date or place of publication: see Hain 10482–10486, and the *Census of Fif-*

and again, rather than Nicolaus Pergamenus, was the author of the *Dialogus creaturarum moralizatus*, a collection of fables in the form of dialogues between animals and even inanimate objects.<sup>1</sup> In the manuscripts *A Book of Eight Tractates* is also ascribed to Maino. The first tractate deals with waters,<sup>2</sup> and I have seen the second part of it<sup>3</sup> which considers artificial waters such as one of mercury or another made by extinguishing hot gold plates in good spring water forty times. The purer gold is employed, the better. Incidentally Maino remarks that alchemical gold is not useful medicinally for human bodies. He recounts none the less an alchemical process for converting gold into a substance like butter and, although expressing the fear that calcination is poisonous, he proceeds to expatiate upon the marvelous properties of this gold salve. Yet other waters are made from herbs and flowers. Maino died about 1364. Such was the career and some of the other intellectual interests of the author of our sauce-book.

The *Opusculum de saporibus* is preserved in a manuscript of the Biblioteca Nazionale at Naples and there ascribed to Maino.<sup>4</sup> It opens with the assertion that delicious sauces were originally invented by gourmets more for the sake of enjoyment than of health. They are not essential to the promotion of health and sometimes are injurious in that, by whetting the appetite, they induce men to eat more than is good for them or, by rendering bad and spoiled food palatable, they lead men to eat things which disagree with them. They approach the nature of drugs, and one should not take medicine while in good health. Maino therefore advises persons who are in good health to use sauces only in small quantities and to correct or at least abate the badness of certain foods, or in order to stimulate appetite and digestion. Sauces also can be made to serve the retentive and expulsive functions of the body. Therefore Maino will write a single chapter concerning them.

This raises the question whether the *Opusculum de saporibus* may not be an extract from a longer work rather than an independent treatise, and in part it turns out to be identical with a chapter of the *Regimen sanitatis*. But the text in the Naples manuscript<sup>5</sup> includes many more particular sauces than does the

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*teenth Century Books owned in America*, compiled by a committee of the Bibliographical Society of America, New York, 1919.

Ascribed to Arnald in the Lyons, 1504, edition of his *Opera*, fols. 54<sup>v</sup>, col. 2-79<sup>v</sup>, col. 1, and in subsequent editions: 'Incipit liber de regimine sanitatis Arnaldi de villa nova quem Magninus mediolanensis sibi appropriavit addendo et immutando nonnulla.'

<sup>1</sup> On the question of the authorship in both cases see Pio Rajna, 'Intorno al cosiddetto *Dialogus creaturarum* ed al suo autore,' *Giornale storico della letteratura italiana*, III (1884), 1-26; IV (1884), 337-360; X (1887), 42-113; XI (1888), 41-73.

<sup>2</sup> Metz 277, 14th century, 2nd item: *Magnus Mediolanensis, Liber octo tractatum*, opening, 'Tractatus primus de aqua et est summa prima de aquis. . .'

<sup>3</sup> Munich, *CLM* 666, 1456 A.D., fols. 108<sup>v</sup>-128<sup>r</sup>: 'Sequuntur proprietates multarum aquarum ex primo tractatu magistri Magnini octo tractatum. Et est secunda summa tractatus primi de aquis specialibus artificiose factis.'

<sup>4</sup> *Naples VIII. D. 35*, 14th or 15th century, fol. 52<sup>r</sup>, col. 2-53<sup>v</sup>, col. 1: 'Incipit opusculum de saporibus domini M. Mayni de Mayneriis. Saporum delectamenta propter voluptatem magis. . . / . . . Et hec sufficiant de saporibus et salsis diversis diversorum alimentorum.'

<sup>5</sup> Rajna had handled this MS. in the Naples library and afterwards obtained some further informa-

printed chapter and so, whatever may be their borrowings from one another or their common source, seems to deserve presentation for what it is worth as a description of mediaeval sauces. Maino's slightly older contemporary, Gentile da Foligno, tells us that in 1345 he composed a *Quaestio de saporibus* but he fails to specify whether this was a discussion of sauces or of tastes.<sup>1</sup>

To return to our sauce-book, there next come more generalizations, some of which occur in the *Regimen sanitatis* and no doubt might be found in other mediaeval medical works. The more a sauce departs from the nature of food, the less one should eat of it, while the closer it approaches to the nature of food, the more can be taken of it. In summer one should abstain from hot spices and substitute for wine and vinegar such liquids as verjuice and lemon juice. In moderate weather the ingredients of sauces should be mild. The more temperate foods are, the less need there is for sauces. But if the food is cold and damp and viscuous, the sauce should be hot and dry and subtle.

'Now it remains to determine what sauces and seasonings are appropriate for various victuals.' For boiled mutton, veal, and kid, Maino recommends a green sauce made of parsley, rosemary, bread crumbs, white ginger, and cloves with vinegar. In summer put in a smaller quantity of the spices and in winter more, adding some wine or weakening the vinegar. Passing over nearly a columnful of recipes for other sauces for meats, we may note that that for roast pork consists of its own gravy with a little wine and onions. For roasted rabbits and small fowl the right sauce is of cinnamon and bits of bread with verjuice in summer or with wine in winter and a little weak vinegar.

Roast pigeons, partridges, and quail require no other seasoning than salt and lemon. But the sauce for boiled capons and pheasants is the water they have been boiled in with pulverized sweet spices and, especially in winter, hyssop, sage, and parsley are to be added, while in summer only green sorrel juice or the tips of vines are to be added to the water in which they have been boiled. Or a white sauce may be made with almonds in place of walnuts, and white sugar added. If capons and fowl and pheasants are cooked whole in pastry, powdered spices and verjuice are used in summer, while in winter may be added a little wine. But if they are cut up first, one may add lard, sage, hyssop, parsley, with powdered spices both sweet and strong. But the sauce for the same when boiled is garlic sauce with almonds or sweet wine beaten up with the same in winter and a few spices or with verjuice and less spices in summer. For roast ducks, geese, and other aquatic birds the fitting sauce is black, pepper sauce compounded of toast soaked in vinegar and roasted liver pounded together and qualified with the basting and verjuice, and let them all boil together until thick.

The fatter fish are, and of more humid nature and difficult to digest, so much the more do they require sharp, hot sauces. This is true also of meats, whence it

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tion concerning it. But he gave no extended account of the *Opusculum de saporibus* which he regarded either as a chapter from a fuller manuscript text of the *Regimen sanitatis* which had been curtailed in the printed version, or as an expansion of such a chapter: see *Giornale storico della letteratura italiana*, x (1887), 112-113.

<sup>1</sup> *Naples VIII. D. 42*, last leaf (unnumbered) recto, col. 1.

follows that bestial fish, especially the porpoise, whether broiled or boiled, require a very hot and sharp sauce. Therefore the sauce for the porpoise is a strong boiled black pepper sauce composed of black pepper, cloves, and toast soaked in vinegar and mixed with the gravy of the fish itself. Or it may be preserved in a jelly with cinnamon, galingale, and cloves. There follow sauces for sturgeon, lampreys, eels, salmon and trout, other fish and crabs. For fried oysters the proper sauce is verjuice with powdered spices or a boiled yellow sauce.

Below is reproduced the full text of the opusculum from the Naples manuscript, followed by that of the chapter from the 1504 edition of the works of Arnald of Villanova for purposes of comparison. Both the cooking and vocabulary appear to be Milanese, thus attesting Maino's authorship, and the sauce-book includes a number of words which are difficult to find in ordinary dictionaries and should be noted in the forthcoming new dictionary of mediaeval Latin.

(From *MS. Naples VIII. D. 35*, fols. 52<sup>r</sup>, col. 2-53<sup>v</sup>, col. 1.)

Incipit opusculum de saporibus domini M. Mayni de Mayneriis.

SAPORUM delectamenta propter voluptatem magis quam propter sanitatem a gulosis fuerunt primitus adinventa non cum sint multum necessaria in sanitatis regimine ymmo quod plus est interdum inferunt nocumenta. Nam propter huiusmodi saporibus homo plus comedit quam eius natura requirit et quam expediat sanitati. Amplius propter huiusmodi saporibus cibaria mala et corrupta ori efficiuntur delectabilia et ab hominibus comeduntur que ab eis non suscipiuntur. Amplius saporibus ut per plurimum sapiunt naturam medicinalium que in regimine sanorum a sapientibus denegantur debet enim conservatio sanitatis abstinere ab omni medicinali. Dico igitur quod huiusmodi saporibus non est utendum in sanitatis regimine nisi in pauca quantitate et ut corrigatur quorundam ciborum malitia seu saltem remittatur. In omnibus autem habentibus defectionem appetitus huiusmodi saporibus et salse multum expediunt ut melius et delectabilius valeant alimenta suscipere. Non solum autem huiusmodi saporibus iuvant appetitivam ymmo etiam digestivam. Et sicut fiunt saporibus deservientes appetitui et digestionem sic etiam fiunt et fieri possunt saporibus qui deserviunt retentioni et expulsionem. Propter huiusmodi saporibus delectamenta quibus homines uti consueverunt intendo de saporibus facere unum capitulum singulare.

Primo igitur ponam quasdam considerationes singulares in saporibus et salsis observandis. Prima consideratio est quod ex saporibus parum comedatur quia naturam sapiunt medicinalium ex quibus sani parum vel nichil (fol. 52<sup>v</sup>, col. 1) sumere debent. Non est etiam artificiale permiscere cum materia cibali illud quod sapit naturam medicinale. Secunda consideratio est quod quanto sapor plus distat a natura cibi tanto minus ex eo est comedendum. Et econverso quanto plus appropinquat nature ciborum tanto plus potest ex eo summi. Tertia consideratio quod temporibus etate et conclusione frigidis utendum est salsis calidis et econverso. Unde saporibus materia in estate sit agresta succus limonum citrangelorum acetum et succus viridis acedule et extremitatum vitis vinum granatorum aqua rosarum amigdale et panis assus fusus in aceto vel in aliquo predictorum succorum et nullo modo apponantur species calide nisi forsitan in paucissima quantitate sed bene potest addi aliquid serpilli vel petrosilli ad obtemperandum predicta. Nature autem saporibus in tempore etate et conclusione frigidis sunt sinapium eruca zingiberi albumi piper cinamomum gariofilus alleum salvia menta serpillum petrosillum vinum aqua carniem et acetum non forte et propinquum nature vini. In temporibus autem mediocribus materie saporibus sunt mediocres. Quarta consideratio est quod quanto cibi sunt temperatiores et temperamento propiores tanto minus ex saporibus est comedendum cum eis. Et similiter saporibus eis competentiores sunt et esse debent temperamento propiores et econverso quanto cibi sunt magis lapsi a temperamento tanto indigent saporibus magis lapsis ad



oppositum lapsus ciborum unde si cibi declinant ad frigidum et humidum et viscosum sapor debet esse calidus et siccus et subtiliativus et econverso si cibi sunt calidi et sicci sapor debet esse frigidus et humidus.

Nunc restat determinare qui sapes et que salse quibus cibis sunt convenientes. Salsa igitur pro carnibus castratinis vitulinis et edinis elixatis est salsa viridis que sic fit. Recipe petrosilli m.<sup>1</sup> i rorismarini quartam m. unius panis assi ad quantitatem unius ovi zinziberi albi ʒ<sup>2</sup> i gariofilii xii. Fiat salsa cum aceto sed in estate apponatur minus de speciebus et in hyeme plus. Iterum in hyeme in predicta salsa ponatur aliquantulum vini vel quod ace- (col. 2) tum sit minus forte. Item in hyeme potest sufficere sinapium dulce compositum cum vino cocto et paucio melle vel eruca composita cum amigdalibus et aceto non nimis forti.

Item possunt preparari carnes vituline lactantes in cinefio. Recipe panem assatum nigrum infusum in aceto piperis triti unciam unam lardi liquefacti lib. i in quo lardo frigan- tur carnes cepearum albarum numero xv et coquantur cepe et fiat cinefium (*cinesium* in the MS) cum aqua carniū supradictarum et panis et cepe optime quassabantur in mortario et addantur species supradicte et bulliatur totum simul usque ad spissitudinem.

Item carnes edine possunt preparari cum brodio albo. Recipe amigdalarum dulcium libram i zinziberi albi tricti unciam unam agreste medietatem quartini et temperetur cum aqua carniū.

Item salsa carniū bovinarum est piperatum croceum bullitum quod fit ex pipere et croco et pane infuso in aceto in hyeme in estate in agresta cum aqua carniū et bulliatur totum simul et potest sufficere eruca.

Item possent comedi carnes bovine cum alleata alba ex nucibus et zinziberi albo et alleis distemperatis cum aqua carniū et bullitis.

Item salsa carniū porcinarum elixatarum est eruca et sinapium. Sed si predicte carnes pastilentur apponantur species dulces et fortes et agresta et lardum porcinum bene pistatum in mortario et aliqui apponunt cepe album et caseum butirosū et medullam bovum. Et si fiant pastilli ex carnibus subtilioribus apponatur lac amigdalarum cum vino granatorum vel agresta et pulvis specierum dulcium. Et potest in fine addi ovum conquassatum cum agresta.

Assature porcine sapor conveniens est liquor descendens ab assatura conquassatus cum paucio vino et cepis decoctis et hoc in hyeme vel salsa viridis superius rominata. Et potest sufficere sinapium vel eruca. (53<sup>r</sup>, col. 1)

Assaturis autem cuniculorum et pullorum parvorum sapor conveniens est salsa camelina ex cinamomo et mica panis cum agresta in estate vel cum vino in hyeme et paucio aceto non forti.

Assature autem turturum perdicum columbarum quallearum nullo alio sapore indigent nisi sale et pomo citrō.

Caponum autem et fassianorum elixatorum sapor est aqua decoctionis eorum cum pulvere specierum dulcium et specialiter in hyeme addatur in decoctione ysopus salvia et petrosillum et in estate sufficit aqua decoctionis eorum cum succo acedule viridis vel extremitatum vitis. Vel potest fieri salsa alba cum amigdalibus loco nucum et addatur zucorum album.

Si capones et galline et fassiani pastillentur integri, apponatur pulvis specierum et agresta in estate et in hyeme potest addi aliquantulum boni vini.

Item si pastillentur non integri sed incisi potest addi lardum et salvia et ysopus et petrosillum cum pulvere specierum dulcium et fortium. Sed sapor predictorum conveniens in assatura est alleata cum amigdalibus superius dicta vel vinum dulce conquassatum cum eisdem in hyeme et paucis speciebus vel cum agresta in estate sed tunc minus apponatur de speciebus.

<sup>1</sup> The abbreviation looks more like an *m* than any other letter of the alphabet but more probably is the sign for some unit of weight or measure.

<sup>2</sup> The sign for a dram.

Assaturis autem anatum et anserum et similium degentium in aquis sapor conveniens est piperata nigra composita ex pane assato nigro infuso in aceto et epate assato pistis simul distemperatis cum liquore descendente et agresta, et bulliant omnia simul usque ad spissitudinem.

De piscibus autem sciendum est quod quanto sunt grossioris carnis et difficilioris digestionis et maioris superfluitatis et humoris nature tanto indigent saporibus calidioribus et acutioribus. Et hoc est verum non solum in piscibus verum etiam in carnibus. Unde sequitur quod pisces bestiales et specialiter porcus marinus assatus vel elixatus indiget salsa calidiori et acutiori Et similiter intelligatur in aliis piscibus secundum quod magis vel minus (col. 2) appropinquant porco marino.

Sapor ergo porci marino conveniens est piperata nigra bullita fortis cuius compositio fit ex pipere nigro et gariofilis et pane asso infuso in aceto, et distemperetur cum aqua piscismet.

Et si quis velit conservare per plures dies fiat gelatina cuius compositio est: Recipe cinamomi galange gariofilorum nunc misce ana 3. m.<sup>1</sup> panis assi medium panem de duobus imperialibus infundatur panis in aceto vini bulliti medium quantenum(?) fiat gelatina cum aqua et vino decoctionis piscis et decoquatur piscis in vino et aqua et erit dicta gelatina sufficiens per decem personas.

Sturionum sapor est salsa camellina cuius compositio est: Recipe zinziberi albi gariofli cinamomi granorum paradisi ana 3. m. panis non assi infusi in aceto forti et fiat salsa cum agresta. Vel potest fieri sapor albus cuius compositio est: zinziberi albi quantumlibet amigdalorum dulcium mundatarum uncie ii allei mundati testam unam. Distemperetur cum liguto(?) seu agresta et aqua decoctionis piscis et colletur per stamineam et bulliatur.

Pro lampridis magnis assatis et murenis recipe zinziberi albi gariofilorum gallange granorum paradisi ana 3. m. panis assi infusi in aceto medium. Distemperetur cum pinguedine piscis et agresta et bulliat. Vel potest fieri gellatina superius scripta. Et sicut dictum est de lampreda similiter intelligatur de murena.

Anguillarum elixatarum vel pastillatarum sapor conveniens est sapor albus sturionum sed loco amigdalorum ponantur nuces, Vel fiat salsa viridis superius scripta cum carnibus castratinis et specialiter cum anguilla coquitur in assatura. Et similiter intelligatur de congino sicut dictum est de anguilla.

Sapor salmonum et trutarum elixatorum conveniens est piperata crocea cuius compositio est talis. Recipe piperis zinziberi albi ana 3. m. panis assi non nigri infusi in aceto et aqua decoctionis piscis medietatem unius panis croci grana ii frumenti iii pondere. Distemperentur omnia simul cum aqua piscis et bulliantur omnia simul.

Assa-(fol. 53<sup>v</sup>, col. 1) torum autem sapor conveniens est agresta vel succus citrangulorum cum pulvere specierum dulcium et similiter pastillatorum.

( )eterlogorum elixatorum sapor conveniens est sapor albus cuius compositio est: Recipe zinziberi albi unciam unam allei testam panis infusi in agresta medium panem. Distemperentur in agresta. Assatorum autem sapor conveniens est salsa viridis superius nominata.

Pro rozetis elixatis sapor conveniens est salsa camellina superius scripta et similiter intelligatur de gormato. Assatorum autem salsa conveniens est vinum cum quo distemperetur zinziberi album et proiciatur super piscem assatum, et deinde bullitur unica bullitione. Sed in estate loco vini potest poni vergutum.

Emerorum sapor conveniens est aqua decoctionis eorum cum pulvere specierum dulcium.

Cancrorum sapor conveniens est salsa viridis superius scripta et hec eadem salsa valet ad tencam elixatam. Sed tenca assata impleatur cum petrosillo et pulvere specierum et agresta intus et extra. Et addatur aliquantulum de oleo olivarum in agresta que apponatur ab extra. Et similiter intelligatur de pigo.

<sup>1</sup> Here and in several subsequent cases probably what is meant is three drams, that is, the weight sign for dram, followed by *iii* rather than *m*.

Pro carpilione sapor conveniens est salsa camellina cum succo citrangulorum. Compositio cameline superius scripta est.

Sapor conveniens pro parvis piscibus est salsa viridis vel sinapium dulce. Et pro cancris fluvialibus est acetum cum multo sale.

Pro ostreis frixatis sapor conveniens est agresta cum pulvere specierum. Vel potest fieri sapor croceus bullitus superius scriptus. Et hec sufficiant de saporibus et salsis diversis diversorum alimentorum.

Liber de regimine sanitatis: Pars II, Cap. 24.<sup>1</sup> De condimentis et saporibus

Ea ex quibus cibaria condiuntur in sanitatis regimine non sunt modicum utilia propterea quia gustui efficiuntur delectabiliora et per consequens digestibiliora. Ea autem quibus cibaria communiter condiuntur sunt sagimen oleum et butyrum. Experientia autem docet quod comestibilia comesta sine sale sunt ori insipienda. Sal igitur comestibilibus addit bonitatem saporis et humiditatem quandam aquosam indigestione aufert et sic perfectius cum sale digeruntur et decoquuntur quam sine sale. Salis autem proprietas est humiditates extraneas et superfluas desiccare deinde quod remanet fortius constringere et adequare: et ex dictis potest elici sufficienter quod cibaria indigent pluri aut pauciori sale in eorum condimentis et similiter de cibis piscium sicut carnum. Nam viscosa et superflue humida et grossa plurimo sale indigent, et cibaria sicca non superflue humida et subtilia indigent minimo sale et mediocria mediocriter. Amplius in defectu carnum indigemus ad condimentum olerum et leguminum oleo butyro vel sagimine. Nam quia olera et legumina sunt nature melancolice et terrestris bonum est ea condiri cum aliquo unctuosio aereo eorum terrestreitate obtemperante ex quo etiam sapor eorum efficitur suavior et delectabilior et per consequens fiunt ad nutrimentum digerendum meliora. Oleum autem olivarum inter cetera olea est dulcius temperatius et nature amicabile. Oleum autem nucum est multum calidum et siccum et similiter oleum lini nec eorum sapor est ita nature amicabile. Oleum autem papaveris quo aliqui utuntur est boni saporis et odoris declinans ad frigiditatem, non tamen sic competit in sanitatis regimine. Oleum autem amigdarum dulce est satis laudabile et temperamento propinquum. Butyro autem defectu olei quandoque condimus cibaria et etiam sanguine sicut est sanguinis porci.

Saporum delectamenta ob voluptatem magis quam propter sanitatem a leccatoribus fuerunt inventa unde non sunt multum necessaria in sanitatis regimine. Nam per tales sapores homo plus commedit quam natura requirat quare nature sunt nociva et si aliquis sanus tales sapores appetat est ex consuetudine cum dampnosum est subito permutare dandum est enim consuetudini. Nam homini sano tales sapores non conveniunt nec via cibi nec via potus ut bene patet consideranti. Utentibus igitur propter consuetudinem aut alias observantur ista. Primo quod in sanitate parum de salsamentis sumatur et quanto plus salsamentum distat a temperamento tanto minus de eo sumatur et quanto plus appropinquat temperamento et nature cibi aut potus propinquior tanto plus ex eo potest sumi. Amplius nota quod tempore calido sapores declinent ad frigidum et tempore frigido ad calidum et tempore medio sint mediocres. Amplius sapores diversificantur ex diversitate ciborum ut sciunt coci dominorum.

Castratorum igitur elixatorum et capriolorum sapor convenientior est salsa viridis. In estate quidem ex aceto et agresta cum paucissimis speciebus sive alliis cum petrocilio paucio zinziberi albo et agresta et aceto et paucio pane asso infuso in aceto vel agresta. Et in hyeme fit eadem salsa cum pluribus speciebus et paucio alio et optimo vino et pauca agresta vel possunt sufficere eruca et sinapium.

Sapor autem carnis bovine elixate est ex pipere et pane asso aqua carnum et pauca agresta, et iste idem sapor satis est conveniens carnibus porcinis specialiter in hyeme et potest sufficere sinapium vel eruca. Sed quando comeditur eruca debet pistari cum amigdalibus et distemperari cum aceto in estate et vino optimo in hyeme. Possunt etiam comedi carnes porci frigide cum aceto et petrocilio in principio refectionis. Si autem predictae carnes pastillentur apponatur cepe album aut species dulcis cum caseo butyroso.

<sup>1</sup> *Arnaldi de Villanova Opera*, Lyons, 1504, fol. 69<sup>r</sup>, col. 2-69<sup>r</sup>, col. 1.

Assature autem perdicum et fasianorum et turturum nullo indigent sapore nisi sale. Nota universaliter tam pro carnibus quam piscibus quod quanto carnes sunt aut pisces viscosiores et difficilioris digestionis et maioris superfluitatis et humidioris nature tanto indigent saporibus calidioribus et acutioribus ut piperata etc. Gallinarum autem elixatarum est ysopus petrocilii et croci et assatarum est liquor descendens cum saporì convenienti respectu temporis. Et hec de saporibus breviter sufficiunt.

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## NOTES ON EARLY CHRISTIAN LIBRARIES IN ROME

By ETHEL D. ROBERTS

IT was the opinion of Monsignor Rocca, sometime librarian of the Holy See, that the library had its beginning from St Peter himself, and another learned man attributes its founding to St Clement, who was elected to the Papal Chair in the year 93. The *Martyrium Clementis*, which is traditionally a contemporary document, attributes to this Pope the compilation of a list of the poor in all the regions of Rome, which would of course have been kept in the archives of the time.<sup>1</sup> However that may be, it is certain that before any central Christian library existed in Rome, individual churches possessed libraries or collections of codices.<sup>2</sup> That Christian communities soon after the propagation of the Gospel provided themselves with libraries is proved by many passages in the *Acta Sincera Martyrum* from the time of Nero to Julian the Apostate. These naturally differed in size, but besides the sacred scriptures, contained also commentaries and other works by Fathers and Doctors of the Church, together with the archives, lists of communicants, pastoral letters, and especially the Acts of the local martyrs and the reports of their judicial trials, the latter procured often at great cost. The *Liber Pontificalis* relates that a certain priest Massimus, commissioned by Pope Anteros in the third century to obtain such a report, lost his own life in the attempt. The ecclesiastical tribunals, too, had to have all documents connected with their trials preserved, and the library of the church was also the repository of certain legal documents relating to the freeing of slaves, an act which after Constantine was solemnly performed in the churches.<sup>3</sup> Other records of great importance were the professions of faith or recantations of error required from professors of philosophy and theology suspected of heresy, or at least of unsound doctrine. Tertullian mentions such a case and Origen sent a written *libellum poenitentiae* to Fabianus.<sup>4</sup>

Justinian required that a copy of his laws should be kept in the treasury of the Church; codices, like the sacred vessels, being regarded as treasures. In some cases, the collection of codices was placed in the apse of the church which was

<sup>1</sup> Cabrol, *Dictionnaire d'Archéologie Chrétienne* (Paris, 1910), s.v. *Bibliothèque*.

<sup>2</sup> An ancient library was attached to the church of San Teodoro which disappeared during the sack of Rome in 1526 (Tucker and Malletson, *Handbook of Christian & Ecclesiastical Rome*, 1 [London, 1897], 347).

<sup>3</sup> Cabrol, *op. cit.*

<sup>4</sup> De Rossi, 'La biblioteca della Sede Apostolica' *Studi di storia e diritto*, vol. v (1884).

Sanitation in French Towns

Author(s): Lynn Thorndike

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# SANITATION IN FRENCH TOWNS

By LYNN THORNDIKE

IN connection with the recent paper of Ernest L. Sabine on 'Latrines and Cess-pools of Mediaeval London',<sup>1</sup> and my own earlier 'Sanitation, Baths, and Street-Cleaning in the Middle Ages and Renaissance',<sup>2</sup> it may be worth while to reproduce two sections from Laurent Bouchel's *La bibliothèque ou thresor du droit français* (2 vols, 1615) summarizing the previous regulations of various French towns on the subjects of *Latrines* and *Ordures*.

Habitans des villes auront Latrines en leur maisons. Paris art. 19. Calais art. 179. Melun art. 210. Estampes art. 87. Mante(s) art. 107. Nivernois chap. 10, art. 15. Orleans art. 244 et 245. Dunois art. 63. Bourbonnois art. 515. Tournay tit. 17, art. 5. Entre Latrines ou aisèm7ns et le puits du voison y aura dix pieds et un contre-mur de chaux et sable. Dourdan art. 67. Montfort art. 26. Mante(s) art. 98. Rheims art. 567. Mehun art. 209. Estampes art. 88. Grand Perche art. 220. Chalons art. 142. Cambray titre 8, art. 4.

Latrines ou égouts de cuisine ne peuvent estre faits dans le mur mitoyen. Berry tit. 11, art. 11. mais l'on en peut faire auprès ledit mur pourveu que l'on delaisse espace raisonnable entre ledit mur mitoyen et les Latrines ou égouts de cuisine en telle maniere que lesdits Latrines ou égouts ne portent dommage au voison. In suo enim hactenus quidquam facere licet ut alii detrimentum non adferatur. Idem de gravi aliquo odore sentiendum. Harmenop. lib. 2, tit. 4, ¶83.

Neuf pieds. Orléans art. 246. Rennes art. 724.

Dix-sept pieds. Laon art. 267.<sup>3</sup>

Ordures ou immondices ne seront portées devant les maisons d'autrui, places ou ruës vuides etc. Mehlun art. 343. Estampes art. 87. Nivernois chap. 10, art. 16 et 21. Bourbonnois art. 515.

. . . ne peuvent estre tenuës hors les maisons plus haut de 24 heures. Berry tit. 11, art. 19.

Ne doivent ester apportés aux fossez des villes Royales de Berry ne en la fosse des Arenes à Bourges. la mesme art. 20.

Eau ou autre chose ne sera iettée par fenestre ou ruë publique sans crier par trois fois. Bourbonnois art. 161.<sup>4</sup>

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## NOTES ON THE *EXCIDIIUM TROIE*

By W. A. OLDFATHER

MR E. BAGBY ATWOOD has recently published (*SPECULUM*, IX (1934), 379-404) the first part of an interesting mediaeval account of the fall of Troy, which, as he convincingly argues, goes back eventually, and in a fuller form, to some handbook prepared in classical times. One might, indeed, query the ascription precisely to the 'reign of Nero or thereabout' (p. 390), for the pedantry involved in

<sup>1</sup> *SPECULUM*, IX (1934), 303-321.

<sup>2</sup> *Ibid.*, III (1928), 192-203.

<sup>3</sup> Laurent Bouchel, *La bibliothèque ou thresor du droit français* (2 vols, 1615), II, 502, col. 1.

<sup>4</sup> *Ibid.*, II, 857.

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A Weather Record for 1399-1406 A.D.

Author(s): Lynn Thorndike

Source: *Isis*, Vol. 32, No. 2 (1940), pp. 304-323

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## A Weather Record for 1399-1406 A.D.

One of the fullest, if not indeed the most detailed, weather record for so early a date is provided by a manuscript in the University library at Basel, where more than a hundred leaves of folio size written in double columns are devoted to the years 1399 to 1406 (1). Over sixty leaves are occupied by a daily record of the positions of the planets and the state of the weather from August 31, 1399 to June 25, 1401, with accompanying *figurae coeli* and further astrological detail, usually concerned with conjunctions of the planets. The more than forty remaining leaves are arranged in the more condensed form of a tabulated almanach, with the weather indicated against some days but not for others, covering from July, 1401 to March, 1406. For the first two years the daily weather record appears to have been written in after the event in spaces left blank after the statements of the positions of the planets. These positions are probably reckoned from astronomical tables rather than determined by observation. The entry as to the day's weather is commonly expressed in the past tense, "Dies ista fuit..." etc., and written in a coarser hand than the planetary positions. After June 25, 1401, the weather indicated for certain days may have been predictions rather than an actual record such as precedes that date. In appraising this weather record it should be kept in mind that the Julian calendar then in use was about ten days in arrears so that winter came that much sooner and spring began that much earlier.

Some account may be given of the other contents of the manuscript. Its first sixteen leaves are occupied by the Summa of WILLIAM OF ARAGON upon the Centiloquium ascribed to

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(1) Basel F III 8, paper folio, fol. 116v, col. 1, 202v.



PTOLEMY (2), written in a hand of the fourteenth century. Unfortunately it is mutilated at the beginning so that the incipit cannot be noted (3). Fols. 20<sup>r</sup>-40<sup>v</sup> contain ALCABITIUS, *De iudiciis astrorum*, in the Latin translation by JOHN OF SEVILLE. This copy of it was made in the year 1355. At fols. 44<sup>r</sup>, col. 1-48<sup>v</sup>, col. 1 is a tract on the revolutions of years attributed to HERMES (4). Besides various astrological tracts by and excerpts from Arabic authors such as MESSAHALLA, ALBUMASAR, JERGIS, AOMAR, ALKINDI, HALY, the Jew Abraham AVENEZRA, and "DOROCHIUS" who is presumably the Greek DOROTHEUS, we encounter the pseudo-Hippocrates *De iudiciis astrorum* (fols. 58<sup>v</sup>-59<sup>r</sup>), an extract from JOHN OF ESCHENDEN (5), an anonymous tract on astrological weather prediction opening, "*De dispositione aeris et eius accidentibus ex motu stellarum pronosticare cupiens Primo oportet te scire proprietates universales locorum...*" (fols. 92<sup>r</sup>-103<sup>r</sup>, col. 2), JOHN OF SEVILLE's translation of part of the *Secretum secretorum* of ARISTOTLE to ALEXANDER, ARNALD OF VILLANOVA's *Regimen sanitatis* to the king of Aragon, and the first two books of THOMAS OF CANTIMPRÉ, *De natura rerum*. These last three items follow our weather record at fols. 223<sup>r</sup>, 224<sup>r</sup>, and 232<sup>v</sup>-263<sup>r</sup> of the manuscript.

At the head of the first page of our particular treatise is written : "Anno 99 Augustus Coniunctio precedens introitum solis in libram." A little table at the top of the first column then gives the day, minutes, seconds and thirds of the mean conjunction of sun and moon, the true conjunction, the true conjunction in days not equated, and in days equated. The day seems to be August 31, 1399 in every case. Then follows a *figura coeli* in whose inner square is written in Latin, "Note that the time of this conjunction was for the greater part rainy, but some days were of dry complexio." Astrological notes, apparently upon the foregoing, fill the rest of this column, the second column on

(2) Another MS at the British Museum is Harleian 1, fol. 76<sup>v</sup>. Concerning WILLIAM OF ARAGON see my *History of Magic and Experimental Science*, II, 300-302.

(3) In the Harleian MS it is, "Sicut dicit Ptholomeus in proverbiis almagesti, 'Non fuit mortuus...'"

(4) Fol. 44<sup>r</sup>, top margin : "Sententia (?) Hermetis de revolutionibus. De revolutionibus annorum. Haly Abenragel ponit hec dicta Hermetis." The text opens : "Secundus post conditorem orbis Moderator sol..."

fol. 116r, and much of the first column on fol. 116v. Then it is stated that "this day, namely the last of August, was cloudy, and there was rain for three continuous hours and in the night much rain and wind." No clue seems to be given as to where these observations were made, although perhaps it might be inferred from the positions of the planets. For the first of September these are stated as follows. "Moreover, on the first day the sun was in the 17th degree of Virgo, the moon in the 28th degree of Virgo moving swiftly latitude south — M(eridionalis?), Saturn in the 19th degree of Sagittarius equal in motion westward (occasu) latitude north (Septentrionalis), Jupiter in the 8th degree of Virgo directly combustus latitude north, Mars in the 29th degree of Scorpio direct westward latitude south, Venus in the 21st degree of Libra direct westward, Mercury in the first degree of Virgo direct eastward." A note points out that the sun is in conjunction with Jupiter, while the moon recedes from conjunction with the sun and is in quartile aspect with Saturn and sextile with Mars and seeks conjunction with Venus, Jupiter also is in quartile aspect with Saturn and sextile with Mars.

I shall now, omitting further positions of the planets, indicate in brief English paraphrase the weather recorded for each day through a full year from September 1, 1399 to August 31, 1400 inclusive.

### September

- 1 Day rainy and cloudy, night cloudy and air cold.
- 2 Day cloudy and overcast, west winds very strong and cold, night overcast.
- 3 Day fair and clear with north wind in lower air, in the morning mist, at night clear.
- 4 Day fair and clear and wholesome (bone complexionis), night clear.
- 5 A. M. fair and clear, P. M. cloudy and hot; after sunset dark clouds with coruscations and a little thunder, in the night heavy rain.
- 6 Rain all day, long heavy rains, night cloudy with some rain.
- 7 Day partly fair, partly cloudy, clouds from west, in the night rain again

- 8 Day cloudy with a light rain sometimes fair, at night occasional light rain.
- 9 A. M. dark, cloudy and rainy; P. M. fair intervals, about sunset rain.
- 10 A. M. misty and humid, P. M. fair and east winds with clouds in the north.
- 11 A. M. misty with cold north wind, but P. M. fair.
- 12 Day changeable, now clouds, now fair, now west wind, now east, now north; night also cloudy and sometimes clear.
- 13 Day part cloudy, part fair, night likewise.
- 14 Day fair, night likewise.
- 15 Day fair and hot, night likewise (6).
- 16 A. M. misty and fair, P. M. clouds from the west, at night rain.
- 17 All day long overcast and rainy with west wind, night likewise.
- 18 A. M. overcast and cloudy, P. M. fair, night clear.
- 19 Day fair and wholesome, night clear.
- 20 Day fair and wholesome, night clear.
- 21 Day quite clear and fair and wholesome, night clear.
- 22 Day clear, fair and wholesome, night likewise (7).
- 23 Day fair and clear, night likewise.
- 24 Day fair and clear, night likewise with east wind.
- 25 Day fair and clear, clouds during the night.
- 26 A. M. misty, P. M. fair and clear, night likewise.
- 27 Day fair and clear, night likewise.
- 28 A. M. fair and clear, P. M. clouds from west, at night likewise small clouds.
- 29 Day cloudy and rainy (8).
- 30 Misty, thick mists from corrupt air; afternoon fair for a while, but after vespers clouds again from the east and likewise during the night.

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(6) A note in connection with a figura coeli and table for this date points out that the time of this opposition (of sun and moon) was dry, fair and clear except two days about the beginning, when the moon was in Aries, "quod fuit angulus medii celi."

(7) A note in connection with another figura coeli and table remarks that the time of this quarter of the moon was fair, clear and wholesome.

(8) Another figure and table with note that the time of conjunction (of sun and moon) was dry except one day on which the moon was in conjunction with Saturn and Mars in Sagittarius, which was misty and cloudy and overcast.

## October

- 1 Misty, thick mists, corrupt air, aloft east wind, below north;  
after sunset some rain and a thick night.
- 2 Cloudy and overcast but without rain; night likewise.
- 3 Overcast and cloudy; after sunset a light rain resembling dew.
- 4 Fair and wholesome, without clouds however from the west;  
more clouds before sunset and a light rain in the night.
- 5 Warm, dark and rainy.
- 6 Fair and wholesome but with clouds, and the night fair with  
a cold north wind.
- 7 Fair but sometimes cloudy, night fair and cold.
- 8 Part fair, part cloudy, wholesome; about vespers rain began  
with a strong west wind and in the night likewise. Here  
note that about Vespers Mercury entered Scorpio (9).
- 9 Cold with a strong west wind; sometimes light rain, sometimes  
fair.
- 10 Fair and cold.
- 11 Overcast, cloudy and rainy with west wind; cold A. M.
- 12 Fair and partly cloudy.
- 13 Overcast, cloudy and somewhat rainy.
- 14 Very rainy, west wind.
- 15 Cloudy but without rain; there were thick mists on the  
mountains.
- 16 A. M. cloudy and cold, north wind; P. M. fair and clear,  
night likewise.
- 17 A. M. cloudy and cold, north wind; P. M. fair and clear,  
night likewise.
- 18 A. M. cold with east wind and quite fair, night likewise.
- 19 A. M. thick mists with cold wind; P. M. fair and clear,  
but after sunset the weather changed; strong west wind,  
clouds and rain almost the entire night.
- 20 Rainy, heavy showers with violent west winds; after sunset  
hard rain, continued through the night with violent winds.
- 21 Overcast all day with some rain; a very rainy night with  
strong west winds.
- 22 Fair but with a constant west wind and sometimes clouds;  
night thick and cloudy.

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(9) In the positions of the planets for this day Mercury is placed in the thirtieth

- 23 Fair but always with some clouds from the west; night likewise.
- 24 Partially fair but with clouds from the west, about vespers dark clouds, after sunset some rain.
- 25 Overcast and rainy all day, after sunset rather fair, at night clouds.
- 26 Cloudy and dark with west wind, night clear.
- 27 Fair and wholesome, night likewise.
- 28 Partly cloudy, partly fair; night likewise.
- 29 (10).
- 30 Fair but with occasional clouds, night likewise.
- 31 Dark with thick damp mists, night likewise.

### November

- 1 Cloudy and overcast with rain A. M.; night cloudy.
- 2 Partly cloudy and partly fair.
- 3 Partly cloudy and partly fair, night likewise.
- 4 Misty, hoar frost, cold and ice (11); night cloudy and cold.
- 5 A. M. misty, afterwards fair and clear; cold and ice, night likewise.
- 6 Misty and cold, ice.
- 7 Cloudy and overcast, snow; night likewise.
- 8 Overcast and cold, snow A. M.
- 9 A. M. cloudy, later fair and clear, night partly clear and not cold.
- 10 Cloudy and overcast, at night rain.
- 11 Cloudy and overcast, at night rain.
- 12 Overcast and cloudy, a little rain A. M.

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(10) There is no daily record for the 29th but in connection with an eclipse on that day it is noted that the eclipse was not visible because the clouds were dark and thick. However, the obscurity increased perceptibly as the time of the eclipse approached ("sed tamen circa horam eclipsis fuit maior obscuritas visa cum fuerit prope nos." Basel F.III.8, fol. 127r, col. 1). On the previous page (fol. 126v, col. 1) it had been noted that this eclipse could not have a good signification because its *significatores* were unfortunate and also because Mars was in aspect with the place of the eclipse, and Saturn in mid-sky. Hence the eclipse signified wars and effusion of blood and death and unwholesome air, from which would result corruption of things born on earth. And also because the place of fortune was in direct aspect with the place of the eclipse and according to Albumasar would signify deaths and pestilences.

- 13 Cloudy, P. M. cold north wind.
- 14 Misty and overcast because of thick clouds, cold; night likewise.
- 15 Fair and clear, morning frost and cold and ice, about sunset dark clouds from the west.
- 16 Overcast and cloudy, snow and rain, at night much rain.
- 17 Fair and clear till Vespers, then clouds; in the night rain and snow.
- 18 Overcast, A. M. snow, night thick with strong west winds.
- 19 Cloudy, overcast, occasional snow.
- 20 Overcast, cloudy, windy; night likewise; air warm.
- 21 Overcast, cloudy, warm, strong west winds, occasional rain; night likewise.
- 22 Overcast, cloudy, strong and violent warm west winds; P. M. many showers; night likewise with violent winds.
- 23 Cloudy and windy, night likewise.
- 24 Overcast and cloudy, rain in the night.
- 25 Cloudy, night likewise.
- 26 Cloudy and warm, night likewise.
- 27 Cloudy, much rain in the night.
- 28 Partly cloudy but about Vespers it was clear and the night clear.
- 29 Fair and clear, night likewise.
- 30 Overcast and cloudy, at night heavy showers.

## December

- 1 Overcast and cloudy, night likewise.
- 2 Morning cloudy, after dinner fair, night fair.
- 3 Fair, night likewise.
- 4 Overcast and cloudy, night likewise.
- 5 Partly cloudy, partly fair, night likewise.
- 6 Partly fair and partly cloudy, in the night heavy snowfall.
- 7 Overcast and heavy snow all day; at night rain, and the snow melted.
- 8 Overcast and rainy, snow melting all day and night.
- 9 Misty and thawing, P. M. clouds, night likewise.
- 10 Fair and clear, night likewise with east wind.
- 11 Fair and clear, night likewise.
- 12 Clear and fair, east wind.

- 14 Fair and clear, night cloudy.
- 15 Cloudy and thawing, night likewise with light rain.
- 16 Overcast, cloudy, thawing, some rain; night likewise.
- 17 Very dark and rainy, at night west wind, cold and snow.
- 18 Cloudy and overcast, west wind, cold and snow.
- 19 Cloudy, cold and overcast, without rain or snow.
- 20 Cloudy, fair intervals, east wind, cold; night likewise.
- 21 Fair and cold, east wind; night likewise.
- 22 Fair and cold, east wind; night cloudy with cold north wind.
- 23 Morning cloudy and cold north wind; P. M. clear and east wind, but straightway clouds, some snow; night cloudy.
- 24 Fair, night likewise, intense cold.
- 25 Fair, occasional clouds; night likewise; intense cold.
- 26 Overcast and cloudy, snow flurries, intense cold.
- 27 Fair and cold, about sunset clouds, at night rain and melting of ice (12).
- 28 Overcast, rainy and thawing (13), night likewise.
- 29 Fair without cold, clouds again at night.
- 30 Very dark and overcast, thick clouds; night likewise. Not cold.
- 31 Overcast, night likewise. Not very cold.

#### January, 1400.

- 1 Overcast, at night light snow.
- 2 Overcast and cloudy, night likewise.
- 3 Overcast, night likewise except a strong cold east wind began and a light snow.
- 4 Overcast, cold strong east wind, light snow; night likewise.
- 5 Overcast and cold, east wind.
- 6 Cloudy and cold east wind.
- 7 Part cloudy, part fair, cold with east wind.
- 8 Partly fair, partly cloudy and cold; P. M. cold with violent north wind; night cloudy.
- 9 Rainy with melting of ice, night likewise.
- 10 Dark and overcast, P. M. heavy snow, night likewise.
- 11 Cloudy, fair intervals, not cold; heavy snow in the night.

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(12) "resolucio glacierum et gelu."

(13) "cum resoluuntur gelu."

- 12 Overcast, snowing, clearing after midnight.
- 13 Fair, east wind, cold and icy; night likewise.
- 14 Fair and clear, very cold east wind, ice and cold; night likewise.
- 15 Clear and fair, cold east wind; night likewise.
- 16 Fair with strong cold east wind, much ice on the streams.
- 17 Cloudy and cold, night likewise.
- 18 Cloudy, clouds from west, but below a cold east wind; about  
Vespers a snow fall.
- 19 Overcast, snow and rain, some thawing; night likewise.
- 20 Fair with great cold, night likewise.
- 21 Misty and overcast, night likewise with north wind.
- 22 Misty and overcast, cold north wind, night likewise.
- 23 Overcast and misty, cold east wind, night likewise.
- 24 Fair and clear, cold east wind, night likewise.
- 25 Fair and clear, cold east wind, ice and frost (14).
- 26 Fair and clear, cold with east wind.
- 27 Cloudy and cold, clouds from the south, below a cold east  
wind; night likewise.
- 28 Partly cloudy, partly clear and cold with an east wind below  
and a south wind aloft.
- 29 Cloudy, rain began before sunrise, thawing but below an  
east wind.
- 30 Cloudy, thawing, west wind aloft and east wind below; night  
likewise.
- 31 Cloudy, thawing, about sunset a light rain, east wind below,  
west wind aloft, and in the night (unfinished).

## February

- 1 Partly cloudy, partly fair, west wind aloft, east wind below,  
thawing, night likewise, after sunset light rain.
- 2 Partly fair, partly cloudy, clouds from the west and east wind  
below, snow melting.
- 3 Partly fair, partly cloudy, west wind aloft, east wind below,  
snow melting, cloudy night.
- 4 Fair with small clouds from the west, east wind below,  
wholesome air.
- 5 Overcast and cloudy, west wind, thawing.



- 6 Fair and clear, rain in night.
- 7 Cloudy and rainy with fair intervals, night likewise.
- 8 Overcast, light rain, night clear.
- 9 Overcast and rainy, night likewise.
- 10 Overcast and cloudy, at night strong and violent west wind.
- 11 Cloudy and windy, strong west wind, occasional rain, night cloudy.
- 12 Somewhat rainy, east wind in lower air, night overcast.
- 13 Overcast and cloudy, some rain, at night strong west winds and showers.
- 14 Rainy, snow, strong west winds, at night cold north wind and ice.
- 15 Cloudy, snow flurries, strong cold north wind; night clear, east wind in lower air, cold and ice.
- 16 Clear and cold, east wind; night likewise.
- 17 A. M. cloudy, P. M. fair, at night west wind and less cold.
- 18 Overcast and cloudy, west wind; P. M. fair and wholesome; night cloudy.
- 19 Overcast all day, thick clouds, strong west wind, occasional rain, rainy night.
- 20 Cloudy and windy, strong west winds; night likewise.
- 21 Rain all day, strong west winds; night likewise.
- 22 Overcast, windy and rainy all day, very strong west winds especially during the night.
- 23 Windy and cloudy, strong cold west wind, occasional snow and a little hail, occasional rain, at night snow.
- 24 Cloudy, north winds, snow, cold; night likewise.
- 25 Cloudy, cold north winds, snow, ice, after midnight fair, cold, etc.
- 26 Fair, cold north winds, ice; at night, east wind in lower air.
- 27 Clear and fair with cold and frost, at sunset clouds from the north with east wind below, night likewise.
- 28 Cloudy, clouds from west and many showers, but no rain with us.
- 29 A. M. fair with east wind, P. M. strong west wind with clouds. Light rain about sunset and the wind died down, but a strong wind arose again in the night and there was a light rain.

## March

- 1 Overcast, strong west winds, some rain; at night strong west wind and rain.
- 2 Rainy and windy all day, strong west winds; night likewise.
- 3 Cloudy and wholesome, west winds.
- 4 Fair with few clouds, south wind, somewhat warmer; night likewise.
- 5 Rainy, strong west winds; night likewise.
- 6 Overcast and cloudy, strong west winds, occasional rain; night likewise.
- 7 Cloudy and windy, strong west winds, heavy rain in night.
- 8 Cloudy and windy, P. M. strong cold east wind below, south wind aloft; at night heavy rain and snow.
- 9 Very dark and overcast, north wind, snow; night likewise.
- 10 Very cloudy; snow, P. M. cold east wind above and below; night fair with cold east wind (15).
- 11 Fair and clear, cold east wind, in the morning frost and ice (16).
- 12 Fair and clear, cold east wind, in the morning frost and ice; night likewise.
- 13 Fair, east wind, wholesome, but about Vespers and after sunset clouds from the west; night likewise.
- 14 Wholesome, east wind; P. M. scattered clouds from the west without rain; at night a very light rain.
- 15 Fair with scattered clouds, warm; P. M. thick clouds from the south; after sunset rain. The moon was in the angle of the ascendent of prevention.
- 16 Fair, wholesome, warm; P. M. about Vespers thick black clouds; but with us there was no rain and the night fair.
- 17 Fair, wholesome, east wind; night likewise.
- 18 Fair, clear and warm, east wind; night likewise.
- 19 Fair, clear and warm, east wind; night likewise.
- 20 Morning cloudy, clouds from west, but with us no rain; P. M. fair, air wholesome; night fair.

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(15) Our MS has two statements for March 11, but they seem contradictory, so that I have combined the former, "*Nubilosa et in nocte fuit serenum etc.*" with the preceding record for the 10th which lacks any record for that night. But perhaps the second statement for the 11th should be fused with that for the 12th.

(16) "*De mane fuit gelu et glacies*."

- 21 Fair with occasional scattering clouds, temperate heat, night fair.
- 22 Cloudy with fair intervals, P. M. light rain, after sunset coruscations.
- 23 Fair, wholesome; about Vespers clouds from the west but no rain; cloudy night.
- 24 Rain began in the morning and much fell through the day.  
Note that the moon entered the fourth angle of prevention.  
Night rainy.
- 25 Rain all day and night too, but always wholesome and refreshing.
- 26 Rain all day, heavy showers, wholesome; rain through night.
- 27 A. M. cloudy and rainy; P. M. some fair weather and warmer; about Vespers thunder and rain; no rain during the night.
- 28 Fair and warm until Vespers, then a light rain; heavy rain after midnight.
- 29 Quite rainy but at intervals, wholesome and refreshing; at night light rain.
- 30 Change of weather, fair, clouds from north, east wind below, air wholesome; after midnight rain and north wind.
- 31 Overcast; A. M. rainy with north wind but not cold; at night rain.

#### April

- 1 Overcast, thick clouds from the east, no rain with us, but not far off there were showers; night likewise.
- 2 Fair, clear and wholesome, east wind; night likewise.
- 3 A. M. fair with clouds yet..... from west and east wind below; P. M. much thunder and lightning with occasional rain and hail; at night cloudy intervals.
- 4 A. M. partly fair, partly cloudy, hot sun; P. M. showers interspersed with hail and heat; at night clouds.
- 5 A. M. overcast, clouds from west, occasional drops of rain, air hot; P. M. now fair, now clouds; after sunset thick clouds; in the night rain.
- 6 A. M. rainy, and especially around sunrise there were heavy showers, and the air of hot complexion; P. M. fair; at night clouds without rain.
- 7 Cloudy, fair intervals, strong west wind. And note here the

application of the direction of the wind because the moon receding from conjunction with Jupiter has applied to Mercury from the opposite from an aerial sign.

- 8 Cloudy, clouds from west, air of hot disposition; P. M. light rain.
- 9 Partly fair, partly cloudy, with strong west winds; about sunset rain with strong west wind; in the night high wind and rain.
- 10 Windy, very violent west winds, heavy showers with hail sometimes small; at night clouds, occasional winds and rain.
- 11 About sunrise violent winds with rain, and all day at intervals; night calm and cloudy.
- 12 Like preceding days; corruption of the air by strong west winds and rain; about sunset heavy long-continued rain; night likewise.
- 13 Like preceding days; at night very strong west winds but less cold than during the day.
- 14 Very high west winds with rain, but not so cold as on the preceding days; at night west winds, clouds and some rain.
- 15 Windy like the preceding but the winds were cold; fair intervals; about sunset a change to calm with west wind; after midnight cloudy as on preceding nights.
- 16 Partly cloudy, partly fair, wholesome, light west wind, air calm enough; P. M. fair with clouds from south; night overcast with clouds.
- 17 Overcast, clouds from west, air wholesome; P. M. some rain; about sunset a steady refreshing rain; at night rain.
- 18 A. M. overcast and rainy, air wholesome; P. M. fair intervals with clouds from west and occasional drops; after midnight heavy rain.
- 19 A. M. overcast with clouds from west; P. M. fair; about Vespers air clear and fair; clear and fair all night, west winds in lower air.
- 20 Fair and wholesome, light clouds from west; P. M. occasional light rain and scattered drops; night clear.
- 21 Fair and clear, hot, west wind in lower air; night likewise.
- 22 Fair and hot, east wind below, weak west wind aloft; about sunset clouds from the west without rain; night fair and clear.
- 23 About sunrise black clouds from west but no rain, light rain

- before sunset, day hot and fair, many showers in the night.
- 24 Overcast and rainy, west wind; before sunset north wind in lower air; night very rainy.
  - 25 Overcast and cloudy, sometimes rainy A. M. and clouds, north wind, not cold; night overcast with light rain.
  - 26 A. M. overcast, cloudy and damp below with north wind; but P. M. fair; about sunset clouds and west wind; night likewise.
  - 27 About sunrise overcast, cloudy and damp below with north wind, but straightway it turned fair; night fair and clear, east wind below and aloft.
  - 28 Fair and clear, east wind, hot; night fair.
  - 29 Fair and clear, east wind in lower air, hot, west wind aloft; night also clear.
  - 30 Clear and fair; about noon a strong north wind in the lower air but with warmth; before sunset clouds from the south with... (17).

### May

- 1 Fair and warm, east wind in lower air; P. M. thick clouds at intervals, north wind without rain and heat; night likewise.
- 2 About sunrise mist and north wind; P. M. strong east wind and the day was fair and clear; night likewise.
- 3 Fair and very clear; about sunrise rather cold because there was a cold east wind in the night, but straightway a west wind sprang up in the lower air; night clear.
- 4 Very fair, clear and warm; east wind A. M., north wind in lower air P. M.; night likewise.
- 5 Fair, clear and warm, east wind and sometimes north wind; night likewise.
- 6 Fair and very clear, east wind; P. M. north wind, hot and dry; night likewise.
- 7 Fair and very clear and warm; east wind A. M., north wind P. M.; night fair and clear.
- 8 Fair, clear, warm; east wind A. M., P. M. north wind; about Vespers thick clouds and peals of thunder, but with us there was no thunder and no rain.

- 9 Fair and warm; about sunset a cloud from the north with thunder and coruscations but no rain; east wind in lower air A. M., north P. M.; night fair.
- 10 Fair and warm, east wind below A. M. and north aloft; about Vespers black clouds from the south with thunder, but neither thunder nor rain with us.
- 11 A. M. fair, P. M. clouds from west; very hot without rain; clouds at night but no rain.
- 12 A. M. fair, P. M. clouds from west and a light rain which stopped suddenly, and it was fair again, and afterwards cloudy again, and there was heat and in the night clouds.
- 13 Cloudy and overcast, west wind; P. M. refreshing rain; night clear.
- 14 Morning fair and clear, but suddenly scattered clouds from the west with rain; night likewise.
- 15 A. M. Overcast, clouds from west, some rain with west wind, but no rain here; but P. M. again fair with same wind and scattered clouds; night likewise.
- 16 Like the preceding day cloudy from west without rain among us and with fair weather; about sunset a rainbow and light rain near us but not here; night like the day.
- 17 Fair with scattered clouds from the west, hot; night fair with east wind in lower air.
- 18 Fair with north wind and some dark clouds without rain; night fair.
- 19 Morning overcast by mist, north wind, sudden clearing with strong north wind; night clear.
- 20 Like the preceding fair with scattered clouds, strong north wind.
- 21 Fair and clear, north wind; night likewise.
- 22 Fair and clear, north wind; hot; night fair.
- 23 Fair and warm, west wind aloft; about Vespers black clouds with thunder; about sunset heavy rain, thunder and lightning; no rain in the night.
- 24 Overcast and rainy, loud thunder and heavy rain; some rain in the night but no thunder, west wind.
- 25 Fair and warm; about sunset clouds and rain; in the night clouds with west wind.
- 26 A. M. warm and fair with some clouds; P. M. heavy thunder storm and hail; rain in the night.

- 27 Cloudy, sometimes fair, sometimes light rain; night likewise with west wind.
- 28 Overcast and rainy, heavy thunder storms; at night occasional rain without thunder with west wind.
- 29 Cloudy, frequent rain, west wind; cloudy night.
- 30 Cloudy, occasional rain, fair intervals; night cloudy without rain.
- 31 Partly fair, partly rain with interrupted rain and great clouds; about sunset dark clouds, thunder, rain; at night clouds without rain.

## June

- 1 A. M. fair; P. M. dark clouds, thunder, lightning and rain; in the night light rain.
- 2 Rain all day, clouds from west; night cloudy but without rain.
- 3 Rainy and overcast, clouds from west; at night clouds without rain.
- 4 Morning overcast and cloudy, west wind aloft; later fair with scattering clouds and heat; around sunset dark clouds again with light rain; heavy rain at night.
- 5 All day overcast and rainy, west wind, heavy showers; at night clouds without rain.
- 6 Change of weather, fair and hot, still, north wind aloft and east below. Mars was oriental.
- 7 Fair but before sunset a cloud from the north and heavy rain which came to a sudden stop; night fair and clear.
- 8 Fair; morning mist with north wind; night fair.
- 9 Fair; north wind below and aloft; night fair and clear.
- 10 Fair and clear, north wind; night likewise.
- 11 Fair and warm, east wind below; night likewise.
- 12 Very warm, occasional dark clouds from north and thunder, no rain; night fair and clear.
- 13 Very warm and fair; P. M. dark clouds from north, no rain; night fair.
- 14 Fair and warm, north wind; night fair.
- 15 Fair, clear, warm, north wind; night fair and clear.
- 16 Fair and very warm; night likewise with east wind.
- 17 Very warm and fair, east wind; around Vespere thick clouds

- from the east with thunder and near us showers which ceased after sunset; no rain in the night.
- 18 Morning overcast with heavy mist and west wind; suddenly fair and warm, north wind; after Vespers thick clouds from east with thunder and rain which stopped suddenly; no rain in night.
- 19 Cloudy, clouds from south; about noon dark clouds and thunder from south and heavy rain; after midnight long heavy rain from west.
- 20 Rainy at first and heavy rain with west wind; at night clouds from west without rain and east wind in lower air.
- 21 Partly cloudy from west, partly fair and warm, east wind below; night fair.
- 22 Overcast with clouds, strong west wind, showers; night likewise.
- 23 A. M. overcast with clouds, strong west wind, occasional light rain; P. M. fair with scattering clouds and same wind; night fair.
- 24 Partly fair and partly cloudy, north wind; before sunset a very light rain; night fair with east wind in lower air.
- 25 Morning cloudy from north; before noon fair but around Vespers clouds from west with rain; at night rain and north wind.
- 26 Partly cloudy, partly fair, north wind; about Vespers very light local rains (18); night fair and clear, east wind below.
- 27 Change of weather, mist, then fair and warm, air wholesome, east wind below, west aloft; night fair.
- 28 Fair and clear and warm; about Vespers clouds from west with refreshing showers; night cloudy.
- 29 Overcast and cloudy all day, west wind, occasional hot bursts of sunshine (19), moderate rain in the morning; night cloudy.
- 30 Morning rainy but only light showers, strong west wind; P. M. fair with scattering clouds and very strong west wind; night fair.

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(18) "modica pluvia valde et particularis."

(19) "quandoque radii solis calidi"



## July

- 1 Fair and warm, west wind aloft; night fair.
- 2 Fair and warm, west wind aloft; before sunset dark clouds from south, thunder, lightning, heavy rain; night likewise.
- 3 Fair and warm; P. M. thunder, lightning, rain; rain all night.
- 4 Warm, thunder, coruscations, heavy rain; night fair with east wind below, west wind aloft.
- 5 Rainy with thunder from west; night likewise.
- 6 Overcast and rainy; night likewise.
- 7 Overcast and rainy, west wind; night cloudy, no rain.
- 8 Overcast and rainy all day, frequent west wind; at night rain.
- 9 Overcast, occasional rain, north wind, cold; night cloudy.
- 10 Overcast and cloudy, north wind, no rain; night fair.
- 11 Fair, east wind, change of weather; night fair.
- 12 Fair, clear and warm, east wind; about Vespers north wind; night fair and clear with east wind.
- 13 Fair, clear, warm; morning east wind, P. M. north wind; night fair and clear.
- 14 Fair and warm, east wind; night likewise.
- 15 Fair and warm, east wind; night likewise.
- 16 Very warm and fair; P. M. scattering clouds from east, no rain, west winds below; night fair with east wind.
- 17 Fair and very warm, east wind; night warm and fair with coruscations.
- 18 Fair and warm, east wind; about Vespers dark clouds from east but no rain; after sunset much thunder and lightning from east with light rain.
- 19 Overcast with clouds from north, air hot, only a few drops of rain like dew; night overcast.
- 20 Overcast, thick mist like fog, north wind, cold; after Vespers light rain for some time with same wind; at night much rain.
- 21 Overcast and cloudy, clouds from north; about sunset a change to fair.
- 22 Fair, morning mists, east wind; night clear with east wind.
- 23 Fair and warm, west wind aloft, east wind below; P. M. north wind below; night fair with east wind.
- 24 Fair and warm with winds as on preceding day; night fair with east wind in lower air.
- 25 Fair and warm, west wind aloft, east below; P. M. strong

west wind aloft and below, but fair; night fair, east wind below.

- 26 In all respects like the previous day; night likewise.
- 27 Fair and warm as before, but P. M. clouds from west and thunder and lightning with rain; frequent rain in the night.
- 28 Morning, overcast, rainy, warm; about noon a sudden change to fair; about Vespers clouds, thunder and heavy rain near us with hail; night fair with clouds.
- 29 Cloudy with fair intervals, strong west wind sometimes and sometimes light rain; night cloudy, west wind aloft, east below.
- 30 A. M. cloudy, west wind aloft, east below; change to fair and warm with west wind; night fair, east wind below.
- 31 Fair and warm, occasional clouds from west; about Vespers clouds from south with loud thunder and violent rain; afterwards fair and warm; night fair and warm.

### August

- 1 Fair and very warm; about Vespers clouds from south and thunder, then fair and warm again; night fair.
- 2 Very fair and very warm, east wind below; after midnight heavy thunder showers, yet night hot.
- 3 Fair and very warm; about sunset and after dark clouds from south, thunder showers with hail; later the night was fair again.
- 4 Overcast and cloudy with occasional rain and clouds from north; after midnight steady rain.
- 5 Very overcast and rainy, north wind; night likewise.
- 6 Fair and warm, occasional clouds from west; night cloudy; after midnight strong wind and heavy rain.
- 7 Fair, occasional clouds, cool west wind; night likewise.
- 8 Fair, occasional clouds from west; night likewise.
- 9 Fair intervals but P. M. thick clouds with rain from west; no rain here but near us apparently; night likewise with light rain.
- 10 Cloudy, rain, then fair, west wind; night cloudy with fair intervals.
- 11 Fair and warm, change in air; Mercury began to move directly; night fair.

- 12 Fair and warm; in the night thunder, lightning and heavy showers.
- 13 Fair and warm; at night loud thunder, lightning, coruscations and very heavy showers.
- 14 Fair and warm again; about sunset clouds and coruscations through the entire night, and there was thunder not far from us.
- 15 Cloudy and rainy, west wind; night likewise.
- 16 Overcast and cloudy; A. M. rain with west wind; showers in night.
- 17 Cloudy and rainy A. M.; P. M. fair intervals; night likewise; rain before sunset.
- 18 Cloudy; A. M. rain; P. M. fair intervals; night cloudy without rain.
- 19 Morning cloudy with occasional light rain; P. M. fair and hot; night overcast and cloudy.
- 20 Overcast and cloudy; night likewise.
- 21 Overcast, frequent rain, west wind; about sunset a rain set in that lasted all night.
- 22 Overcast all day, north wind; A. M. steady rain; night very overcast with same wind; heavy steady rain after midnight.
- 23 Overcast all day and the rain lasted all day; night overcast.
- 24 Overcast, frequent rain, north wind; night likewise.
- 25 Overcast, rainy, cold; night likewise.
- 26 Overcast and very rainy, north wind; night overcast.
- 27 Overcast and cloudy, north wind aloft, occasional light rain.
- 28 Rainy all day and the rain continued all day; night very overcast, north wind aloft but not cold.
- 29 A. M. overcast, occasional rain, north wind aloft and below; P. M. clouds from north as before but with fair intervals; night fair, change of air.
- 30 Fair, morning mists with east wind; about sunset clouds from west with a ruddy sky; night cloudy; light rain after midnight.
- 31 Cloudy, west wind, frequent light rain, warm; about sunset some thunder.



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## ELEMENTARY AND SECONDARY EDUCATION IN THE MIDDLE AGES<sup>1</sup>

By LYNN THORNDIKE

COMMON sense would suggest that some sort of a school for children has been an institution about as old, universal, and continuous as the family, religion, the state, or society itself. In a savage tribe where dancing constituted the bulk alike of religious ritual, emotional recreation, and general culture, it is probable that all the children would be given instruction in dancing. As epic poetry developed, nearly everyone would be taught either to memorize the poems or at least to listen to them with appreciation. When writing was introduced, reading would necessarily accompany it, and it is a little difficult to believe that henceforth illiteracy ever would be normal. One wonders if the hieroglyphs carved on Egyptian public monuments were understood only by the priests, or if Hammurabi engraved his code on stone merely for the information of governors and lawyers. Byron represented the dying gladiator as dreaming of

His young barbarians, all at play,

but one shrewdly suspects that the kids were really being put through a stiff set of sprouts, and that Roman holidays were more frequent than Gothic ones. Bread and circuses! We have them yet. In Cleveland last year, part of the population was kept from starving by grants from the Federal Surplus Commodities Corporation. Yet last summer the same city broke all records for paid attendance at a professional baseball game with a crowd much greater than any that filled the Colosseum.

Such examples remind us that human nature and human problems have been much the same through history, and that distinctions of ancient, mediaeval, and modern are of little moment. That educational conditions were not very different in mediaeval and modern universities may be inferred from the following incident. In the records of the university of Bologna we read that Jacobus de Farneto of the Roman patrimony was appointed to teach grammar during the academic year, 1384-85, in the quarter of the Sterian gate at a stipend of fifty pounds Bolognese. 'And,' continues the entry, 'he must take his doctor's degree, or at least the licentiate, before the next feast of the Nativity. Otherwise he is to receive no salary.'<sup>2</sup> Indeed, since teaching grammar in the quarters of the city was really only secondary, not university, instruction, we find here a precedent, which American state and municipal governments are only just beginning to follow,

<sup>1</sup> An address delivered at the dinner of the Mediaeval Academy of America, at the annual meeting of the American Historical Association, Dec. 29, 1939.

<sup>2</sup> Umberto Dallari, *I rotuli dei lettori legisti e artisti dello studio bolognese dal 1384 al 1799*, Bologna, 1888-1924, I, 5. Other examples of the same stipulation in the next century are found in the appointment in 1439-1440 of Charles of Mantua to lecture in surgery, 'so that within the year he takes his doctor's degree' (*ibid.*, I, 13), and in the appointment in 1448-49 of Andreas de Mapheis of Verona to teach logic in the afternoon upon the same condition (*ibid.*, p. 27). In both cases the name of neither appointee appears again in the *Rotuli*.

of requiring a doctorate of teachers in high schools. Jacobus appears to have satisfied the requirement, or else the authorities failed to execute their threat, since he continued to teach Latin grammar in Bologna for a decade more until 1396. But at the latest date at which his salary is mentioned, in the years 1388–89, it was still only fifty pounds Bolognese, another striking parallel with the too frequent fate of present instructors.

In this paper I wish to uphold the thesis that in the period of developed mediaeval culture elementary and even secondary education was fairly widespread and general.

From the earlier middle ages the source material is scanty for this as for many other matters, and the evidence hardly adequate for a decision one way or the other. But over fifty years ago Charles Jourdain in his *Mémoire* on the education of women in the middle ages<sup>1</sup> asserted that from the eleventh century on there were clear traces of elementary schools in most of the provinces of France, and that some of these, in his opinion, went back to the time of Charlemagne.<sup>2</sup> Similarly Leach felt that many grammar schools in England could be traced back before the Norman conquest.<sup>3</sup> For education in Italy in the eighth, ninth and tenth centuries one may consult the work of Salvioli,<sup>4</sup> while Hörle's discussion of early medieval clerical education in Italy admits the continuance of a profane tradition under the Lombards.<sup>5</sup> More recently Professor Laistner, in his *Thought and Letters in Western Europe from 500 to 900 A.D.*, has adduced additional evidence as to the education of children in the early ninth century.<sup>6</sup> The ordinance of Theodulfus, bishop of Orléans under Charlemagne, which is cited by both Jourdain and Laistner, that in every village and on every estate in his see priests should arrange for schools to which any Christian father might send his children to learn their letters without payment of a fee,<sup>7</sup> should not be dismissed as an isolated, ideal measure but rather accepted as at least incidental proof that some fathers were paying masters to educate their children.

A like conclusion is to be drawn from the more general decree of the Third Lateran Council in 1179 which reads in part:

Since the Church of God is bound to provide for the needy, . . . in order that the opportunity of reading and making progress may not be taken away from poor children, who cannot be aided by the resources of their parents, let some sufficient benefice be assigned in every cathedral church for a master who shall teach gratis the clerks of the same church and poor scholars.<sup>8</sup>

<sup>1</sup> 'Mémoire sur l'éducation des femmes au moyen âge,' presented to the Académie des Inscriptions et Belles-Lettres in 1874, reprinted posthumously in his *Excursions historiques et philosophiques à travers le moyen âge*, 1888, pp. 463–509.

<sup>2</sup> *Ibid.*, p. 504.

<sup>3</sup> A. F. Leach, *Schools of Mediaeval England* (1915).

<sup>4</sup> Giuseppe Salvioli, *L'Istruzione pubblica in Italia nei secoli VIII, IX e X* (Florence, 1898), 130 pp.

<sup>5</sup> Georg Heinrich Hörle, *Frühmittelalterliche Mönchs- und Klerikerbildung in Italien* (in *Freiburger Theologische Studien*, XIII, 1914), p. 36 et seq.

<sup>6</sup> M. L. W. Laistner, *Thought and Letters in Western Europe, A.D. 500 to 900* (New York, 1931), pp. 159, 164.

<sup>7</sup> *Concilia Galliae*, ed. Jac. Sirmond, II, 215.

<sup>8</sup> III Lateran (1179), cap. xviii.

Whether this decree was executed or not, it shows not merely that the church tried to educate poor children, whether they were intended to become clergy or no, but also that it was a common practice for parents who had the means to do so to pay for the education of their children.

Moreover, this education was often given by masters who were laymen. Davidsohn in his history of Florence and Professor James Westfall Thompson in his recent book, *The Literacy of the Laity in the Middle Ages*, point out that 'Florentine documents of the eleventh century designate a number of laymen as *magistri*' and that 'by the twelfth century even the small towns and villages in the vicinity had their lay teachers.'<sup>1</sup> The notarial records at Genoa contain private contracts between parents and master as to the terms for the instruction of their children. Two years ago in *SPECULUM* Professor Reynolds published one such and another between two teachers who were partners.<sup>2</sup> Villani tells us in his *Chronicle* that in Florence in 1283 there were between eight and ten thousand boys and girls learning to read, while six abacus schools (for training in reckoning preparatory to a business career) had between one thousand and twelve hundred attending, and four great or high schools for grammar and logic had from 550 to 600 pupils.<sup>3</sup> Bonvicinus de Ripa, a schoolmaster of Milan, writing in 1288, seems similarly to distinguish secondary from elementary education, when he estimates that there are in Milan seventy 'teachers of beginning letters' and eight 'professors of grammar.'<sup>4</sup> Thirty-three years later in 1316, of 73 arts listed as subject to a certain tax, the sixty-first comprised 'masters of grammar and of the abacus, and those teaching boys to read and write.'<sup>5</sup> That such teachers were numerous not only in Italy but north of the Alps is suggested by an early twelfth century writer who remarks: 'To say nothing of other parts of the Empire, are there not throughout France and Germany, Normandy and England, not only in cities and walled towns, but even in villages, as many learned schoolmasters as there are tax-collectors and magistrates?'<sup>6</sup> Guibert de Nogent, who lived from 1053 to 1124, indicates that teachers of grammar were much more numerous and better trained in the early twelfth century than they had been in the middle of the eleventh century, when they were scarce even in towns and cities, and were inferior in knowledge even to the wandering scholars of what he calls 'modern times.'<sup>7</sup>

Such evidence shows that elementary and secondary education, while neither free in the sense of being gratuitous, nor compulsory for children of a certain age, was not confined to cathedral and monastic schools. Parents quite generally, if they had the means, were ready to pay local schoolmasters fees to instruct their

<sup>1</sup> R. Davidsohn, *Geschichte von Florenz* (Berlin, 1896), I, 807: cited by Thompson, pp. 55, 75.

<sup>2</sup> Robert L. Reynolds, 'Two Documents concerning Elementary Education in Thirteenth-Century Genoa,' *Speculum*, XII (1937), 225-256.

<sup>3</sup> *Op. cit.*, XI, 93.

<sup>4</sup> Cited by Giuseppe Manacorda, *Storia della scuola in Italia: il medio evo* (1914), I, 142.

<sup>5</sup> *Ibid.*, I, 152.

<sup>6</sup> Leach, *op. cit.*, p. 131.

<sup>7</sup> *De vita sua*, I, iv: Migne, *Patr. Lat.*, CLVI, 845.

children. Indeed, some villeins in fourteenth-century England were apparently willing to pay further a fine at the manorial court for having sent their sons to school without their lords' permission. Tuition charges were modest and reasonable. At Oxford between 1300 and 1347 grammar schools boys 'paid a terminal fee varying from four to five pence, when the usual cost of a scholar's board for one week was eight pence, and a manuscript Donatus, containing about six thousand words, cost three pence.'<sup>1</sup>

The very existence and development of the medieval universities is proof enough of a network of secondary and elementary schools beneath them. Such preparatory schools must also have long antedated the universities. It would have been idle for students to stream to Bologna to learn Roman law, if they had had no previous training and could not understand the Latin of the *Corpus iuris*. The enthusiasm for the first universities would have been incredible without good lower schools to feed them. Only when the number of masters and of would-be teachers at one place became sufficiently great, would a university emerge. Its graduates did not merely enter the legal and medical professions, hold university chairs, or follow an ecclesiastical career. Many of them, for a time at least, became teachers of Latin grammar in secondary schools, and, like the *clericuli vagantes* of whom Guibert de Nogent spoke, spread education through the rural districts. The usual requirement that university students speak Latin, and the devoting of the arts course at the university largely to logic or natural philosophy, imply that grammar, the first branch of the *Trivium*, or the Latin language and literature, had been mastered in a preparatory school.

It is true that boys sometimes came to the university younger than they do today, and that some universities included instruction in grammar. This last is not to be interpreted, as some have inferred,<sup>2</sup> that such institutions gave more attention to the humanities than others. It is rather a sign that they offered elementary courses to remedy the defects of students who came to them ill-prepared. Nor should the early age at which some boys came to the university mislead one into thinking that Latin grammar as then envisaged could be mastered in a short time. Certain historians of education have been so misled and have declared that the middle ages had only higher education, or only primary schools and higher education, that intermediate or secondary schools were practically non-existent, and that, as soon as the pupil knew a little Latin, he began to study philosophy and theology.<sup>3</sup> It is true that the time of the medieval schoolboy was not taken

<sup>1</sup> Crump and Jacobs, *Mediaeval Legacy* (1926), p. 260.

<sup>2</sup> L. J. Paetow, *The arts course at medieval universities with special reference to grammar and rhetoric* (1910).

<sup>3</sup> L'Abbé Augustin Sicard, *Les études classiques avant la révolution* (Paris, 1887), p. 3: 'Le moyen âge n'avait guère connu que l'enseignement supérieur. À peine l'enfant savait-il un peu de latin qu'on s'empressait de l'appliquer à la philosophie et à la théologie.'

Bernard, *De l'enseignement élémentaire en France au XI<sup>e</sup> et XII<sup>e</sup> siècles* (Paris, 1894); 'Le moyen âge n'a guère connu que l'enseignement primaire et l'enseignement supérieur; ce que nous appelons l'enseignement secondaire n'était, pour la grande majorité des étudiants, qu'une rapide transition de l'un à l'autre; à peine l'enfant savait-il un peu de latin, qu'on l'appliquait à la philosophie et à la théologie.'



up by other foreign languages. No doubt, too, his command of Latin increased as he continued to speak, read and write it in the study of philosophy and theology. But the long years required for professional degrees in law and medicine and for the highest degree of doctor of theology warn us that a like deliberate thoroughness would be apt to characterize the earlier acquisition of grammar.

Even Pierre Dubois, who in 1309 drew up on paper an ideal and probably quite impractical scheme for educating specially selected young people of promise from infancy, with the idea of fitting them to convert the East and to hold the Holy Land, and whose plan involved hurriedly cramming them with a smattering of all the then known disciplines, including natural and moral philosophy, law, medicine, and theology — even Pierre Dubois felt that it would take incessant study from the age of four, five or six to that of ten, eleven or twelve years to make proficient in Latin grammar these specially gifted children, ‘selected by some wise philosopher who would recognize the natural disposition likely to make progress in philosophical studies,’ and ‘with heads well formed and disposed for learning.’ Even then they would not have gone into the *Doctrinale* of Alexander of Villa Dei and the *Græcismus* of Eberhard of Bethune at all deeply, while they would not have even spoken their mother tongue for years, and would have learned penmanship and handwriting no one knows when.<sup>1</sup>

First these pupils would read the Psalter, practice singing, and study Donatus. Later the boy would read the distichs of Cato and other Latin authors, having — to quote Dubois’ very words — ‘four long lessons a day or as much as his ability can stand, over which he shall not go to sleep. Let him first hear the teacher read, then another pupil repeat, after whom he shall immediately repeat.’ He is also to learn declensions and rules of voices by repeating these after the teacher. ‘Let the rules be told him in winter: only in the evening shall he do Latin composition.’ As soon as the pupils have picked up a little Latin, they are to speak it ‘at all times and in every place.’ After having heard several elementary authors, they ‘shall hear the Bible in childish fashion three or four times a day. Of its historians and poets only shall they do Latin composition in order, because they write but rudely.’ They go on to construe the *Gradale* and *Breviary* but only a portion of the *Missal*, the *Golden Legend*, and ‘stories from the poets in brief extracts in prose.’ ‘Besides these’ — Dubois continues — ‘Let them make compositions from histories that will be of future use to them, not from the usual superfluous tales; or, what is more appropriate, let them Latinize; then they will lose nothing in idle time as has hitherto been the case; all that they do will be of enduring worth to them. When they have heard the entire Bible, let them repeat it daily for at least one *sexternum*, and the same with the histories of the saints, and they shall do the verses of poets but only plain ones for a short time. At length when they are about ready to study logic, in the three months of summer they shall hear all poetry, namely, on the first day Cato, the second Theodolus, the three following Tobias, and so on with the others; on each day they shall hear six lessons with two teachers, which they could almost all see by themselves,

<sup>1</sup> Pierre Dubois, *De recuperatione terrae Sanctae*, ed. C. V. Langlois (Paris, 1891), p. 58 et seq.

having acquired the stories and the figures of common words. In such writings, where simply the arrangement and conception of what is figured is sought, any youth as soon as he has begun to make any progress can see and read as if it were a romance. At every season of the year and by day and night, deducting sufficient time for sleep, continuously laboring at these tasks, those well disposed towards learning by their tenth or at least their eleventh year, others at least by their twelfth year, God granting, could have gone over all the (grammatical) sciences. Among which let the boys, as their teachers may deem expedient, hear the *Doctrinale* as far as it is concerned with declensions of nouns and conjugations of verbs, and finally the *Graecismus* so that they briefly comprehend its literal sense, not yet insisting on other solemnities.'

The boys then change their locality and begin the study of logic in another school. This together with Greek, Arabic, or some other Oriental language occupies them until fourteen, when they attack the study of natural science. And so on. But it is only their study of Latin grammar that now concerns us. Dubois' program of study for it, while somewhat fantastic and overdrawn, except for its excessive cramming and attempt to take short cuts, probably reflects fairly faithfully the actual grammar school or secondary school curriculum of that time. If an ordinary schoolboy did not begin it until he was eight or ten years old, it would probably occupy him until he was sixteen or eighteen. Even the gifted Gilles de Muisis tells us that he was sent to school when about eight and spent ten years there, 'learning, singing and reading.'<sup>1</sup> Similarly we are informed that Giovanni d'Andrea, the great early fourteenth century representative of the canon law, studied grammar for eight years under the tuition of his father, who was at that time a schoolmaster, after which Bonifacio of Bergamo taught him letters and prophesied that he would become a great doctor.

Recently I have been reading the rotograph of an anonymous and, I believe, hitherto unnoticed treatise on education in a Latin manuscript at the Vatican.<sup>2</sup> Its author would have the boy begin the study of grammar at the age of seven in the springtime of the year and continue it as his chief study, with some music and arithmetic on the side, until the end of his fourteenth year, 'when the light of reason begins to shine.' The next septennium until the age of twenty-one would then be occupied with logic, rhetoric and an introduction to astronomy, and the third period of seven years to twenty-eight with natural science, metaphysics and Euclid, after which in subsequent years might come law or theology. In the case of the boys from seven to fourteen our anonymous author is solicitous to protect their tender limbs and susceptibility to cold and heat. He notes that in many northern regions two different classrooms are provided for summer and winter. Those with physical defects or contagious diseases should not be admitted. The *complexio* of the individual pupil should be carefully considered and one of the sanguine temperament treated in an entirely different fashion from one given to melancholy. Their relative capacity for learning should also be marked

<sup>1</sup> *Poésies*, I, 8: quoted *Histoire littéraire de la France*, 37, 254.

<sup>2</sup> Vatic. Palat. lat. 1252, fols 99v-109r, 'De commendatione cleri.'

early, since some are bright, some even brighter, and some exceedingly bright, while others are dull, others duller yet, and others so stupid that the teacher despairs of them. All, however, should have a recess from study or a play-hour for sports and games, in order to raise their spirits, stir their blood, and recreate their minds.

Another factor, and one which seems hitherto not to have been taken into account in estimating the time required in medieval Latin education, is the extremely abbreviated writing employed during the later medieval centuries alike by masters in writing out their lectures or disputations and by students in taking notes on the same. To know how to read and write Latin as set forth in contemporary manuscripts was no mean achievement, requiring the mastery of a series of abbreviated characters which fill a whole volume today. In order to be able to decipher texts in this script a modern advanced student, even if he has already spent years on the study of Latin, requires special training in palaeography and much further practice. But where a modern student perhaps has first to transcribe the text in long hand, the medieval reader could apparently follow a complicated scholastic argument at sight through these very abbreviated, finely written, and crowded pages. Therefore a medieval scholar not merely needed to know some Latin, he needed to know Latin so thoroughly that he could understand it immediately in the abbreviated writing then commonly in manuscripts. It is also clear from the very voluminous works of the schoolmen that they could compose their arguments in these abbreviated characters, yet in quite grammatical Latin, at a rapid rate of speed. When during the educational process was this ability acquired? At least there is evidence of its long survival. As late as the seventeenth century the curriculum of schools in Champagne included reading French, Latin and manuscripts.<sup>1</sup>

In the later middle ages the rise of municipal schools followed the growth of towns and the communal movement. All over western Europe town governments established new schools of their own and struggled with the bishop or other local ecclesiastical authorities for freedom from church control of these schools and their teachers. Often the dispute was compromised. The increased size and population of the towns required additional schools. But even where the existing church schools were fairly adequate, the town governments seem to have preferred to set up additional schools of their own. By the second half of the thirteenth century this movement had spread to the shores of the Baltic and to Silesia. Lübeck established a municipal Latin school in 1253, Helmstadt founded schools in 1253 and 1267, Leobschütz in 1270, Schweidnitz in 1280, Brieg in 1292.<sup>2</sup>

Sometimes a town also wished to check the over-multiplication of individual private schoolmasters and their rivalry for pupils. This led Troyes, which had already reached its greatest extent as a town a century before in 1239, to unite

<sup>1</sup> M. Poinson, *Histoire générale de la Champagne et de la Brie*, 2nd ed. (Châlons, 1896-1898), III, 276.

<sup>2</sup> H. J. Kaemmel, *Geschichte des deutschen Schulwesens in Uebergange vom Mittelalter zur Neuzeit* (Leipzig, 1882), cap. 3, pp. 56-95.

in 1327 all the schools under a single administration.<sup>1</sup> Ferrara in 1443 decreed that no one should open a grammar school there without first obtaining the consent of the municipal governing board of twelve wise men.<sup>2</sup>

In 1253 Ypres had three great schools (*scholae maiores*) whose masters were forbidden to charge a pupil more than ten sous (*solidi*) a year for tuition, while any supplementary charges for blood-letting (showing that attention was given to the pupils' health), ink, benches, straw, or any payments of fowls and the like in kind were strictly prohibited. In return these three great schools were given a monopoly. Burghers might, it is true, employ private tutors for their children in their own homes but they could not admit children of other families to such lessons. Small or lower or elementary schools, however, might still be opened by anyone without even obtaining a license from the ecclesiastical chapter or town aldermen.<sup>3</sup>

Elementary schools for little children were usually scattered about in different quarters and suburbs of a town. At Lübeck the consuls petitioned the cardinal legate to grant them license to build new schools near the outer parish for the elementary boys, since the access to the schools at the great church was difficult for the youngsters because of the dangerous and crowded way. By 1317 there were four elementary schools in Lübeck. The density and dangers of medieval traffic at the town bridges similarly impelled the government of Breslau in 1267 to grant a concession to found a school at the church of St Magdalen especially for the benefit of the little children who had previously had to go to schools outside the city walls.<sup>4</sup> In France at least there were school-mistresses and separate elementary schools for girls. The name of one such school-mistress appears in the roll for the *taille* in Paris in 1292; in 1380 there were at least twenty-one of them, scattered through the different quarters of Paris.<sup>5</sup>

On the other hand, local histories as a rule represent elementary and secondary education as suffering a decline in the fourteenth or fifteenth century. The founding of municipal schools continued into the sixteenth century, but in most towns there were not so many schools or teachers as there had once been. Sturm in 1538 spoke of the lack of learning throughout Germany and saw no way to remedy it except by beginning at the bottom with elementary schools.<sup>6</sup> Bucer was shocked at the great amount of idleness in England under Edward VI whom he urged to educate the children both in letters and in trades.<sup>7</sup> Later in the same century we find only 247 children attending school at Zurich, and at Basel, printing center

<sup>1</sup> Théophile Boutiot, *Histoire de la ville de Troyes* (Paris, 1870–80), II, 65.

<sup>2</sup> Borsetti, *Historia almi Ferrariae gymnasii*, I (1735), 50.

<sup>3</sup> Henri Pirenne, 'L'instruction des marchands au moyen âge,' *Annales d'histoire économique et sociale*, I (1929), 26. According to Pirenne, the *parvae scholae* did not go beyond the reading of Cato.

<sup>4</sup> *Cod. diplom. Lubec.*, I, I, 175, No. 189, and Korn, *Breslau Urkundenbuch* (1870), I, 35, No. 32: cited by Kaemmel.

<sup>5</sup> C. Jourdain, *op. cit.*, p. 504.

<sup>6</sup> See his 'Consilium . . . curatoribus scholarum Argentorati propositum,' printed by G. Bonet-Maury, *De opere scholastica fratrum vitae communis* (1889), pp. 89–95.

<sup>7</sup> Allen H. Gilbert, 'Martin Bucer on Education,' *Journal of English and Indo-Germanic Philology*, XVII (1919), 321–345.

and university town as it was, but 799.<sup>1</sup> At Strassburg Sturm's plan for educational reform involved the amalgamation of five previously existing schools and their reduction to one. Apparently there was not the support nor the demand for education which had once existed. The new learning may or may not have been superior in quality: in quantity of pupils, schools and teachers there seems to have been a falling off. Despite the advantages to be expected from the recent invention of printing, it would appear that the thirteenth century made a closer approach to popular and social education than the sixteenth.

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<sup>1</sup> F. Paulsen, *Geschichte des gelehrten Unterrichts auf den deutschen Schulen und Universitäten vom Ausgang des Mittelalters* (1919), I, 287.

Some Remarks on the Question of the Originality of the Renaissance

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If, on the other hand, we are today more aware than Burckhardt of the immense importance of the continuity binding the ideas and institutions of the modern world to the medieval past, this insight neither needs nor has the power to undo the lesson learned from a century of studies of the Italian Renaissance. The task before us is increasingly to integrate the two great vistas opened up by medieval and Renaissance research, neither of which gains by their mutual disparagement.

Great Neck, N. Y.

## DISCUSSION

### SOME REMARKS ON THE QUESTION OF THE ORIGINALITY OF THE RENAISSANCE

BY ERNST CASSIRER

I am very glad to accept the kind invitation of the editors of the *Journal of the History of Ideas* to take part in the discussion of "the originality of the Renaissance." But I should prefer not to limit myself to repeating here my own views on this theme, which I have treated in several works, and to justifying them with new arguments. If the question seems to have been so little clarified as yet, and if we are still receiving diametrically opposed answers to it, the responsibility lies, in my judgment, less with any difference of opinion concerning the historical materials themselves than with a lack of clarity as to the *problem* and the *method of investigation* in the his-

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ment of realism in the service of new ideas of the nature and dignity of man and as a help for the discovery of objective natural laws. It is particularly a study by J. Huizinga, "Renaissance und Realismus" (in his *Wege der Kulturgeschichte* [1930], 140-164), that has impressed students of the Renaissance with the necessity of these discriminations. (See this writer's note in the *American Histor. Review*, 46 [1941], 621 ff.). As to the element of "individualism," the discussion of this other Burckhardtian earmark of the Renaissance has passed through similar phases. When many cases of "individualism" were discovered all over the Middle Ages, and in practically every historical period, one group of scholars began to reject the idea that the Renaissance was more "individualistic" than the medieval centuries. But other students, while acknowledging that "individualism" without further specification is not a label distinguishing any one particular epoch, have been increasingly at pains to differentiate the "individualism of the Renaissance" from the individualism observed in other periods. For a study of this latter type, and also an able summary of the recent discussions of Renaissance individualism, see Norman Nelson, "Individualism as a Criterion of the Renaissance," *The Journal of English and German Philology*, 32 (1933), 316-334.

tory of ideas. This point is very clearly brought out in the present papers of Durand and Baron. The following remarks are merely intended to amplify the expositions of both writers in this one particular.

Every philologist is acquainted with the phenomenon we call "semantic change." For linguistics the phenomena of phonetic change, analogic change, and semantic change constitute the only possibility of explaining the facts of language.<sup>1</sup> In semantic change the old forms of speech may indeed be long preserved, but their meaning shifts, and is at times even transformed into its very opposite. This holds also of "semantic change" in history. But the historical "meaning" of a given "idea" is not so easy to ascertain as the linguistic meaning of a word. It always requires a difficult and painstaking analysis. I must refuse to go into this important question here in detail; but I should like to attempt to illustrate it in a few cases which have been much discussed in the recent literature dealing with the Renaissance, and which it seems are at present in the focus of attention.

I. The antecedents of Galileo's science are now much more precisely known than they were a few decades back. When I began my studies in Galileo forty years ago, this field was largely a *terra incognita*. A turning-point here came with the investigations of Duhem.<sup>2</sup> It became clear that by the sixteenth century Aristotle's theory of motion no longer enjoyed the undisputed authority which had often been ascribed to it. We now know that long before Galileo there was a new theory of "impetus" which in many ways prepared the ground for Galileo's dynamics. The antecedents of Galileo's theory of method have also been thoroughly and intensively examined.<sup>3</sup> I clearly remember how surprised I was when in studying Zabarella's works I came upon an explicit statement of the difference between the "compositive" and the "resolutive method" which seemed to show a very marked analogy to Galileo's conception. In my examination of the problem of knowledge I laid great emphasis on this circumstance, which seemed to me very significant historically.<sup>4</sup> That Zabarella was here only one link in a great chain, that he was following a century-old tradition that extends through the whole history of the School of Padua, I have recently learned from Professor Randall's study.

But can all this historical evidence seriously shake our conviction of the incomparable scientific originality of Galileo? I believe that it can only serve to strengthen this conviction and to support it with new arguments. Galileo was completely right when in his *Discorsi e Dimostrazioni* he explained that he was presenting "a very new science about a very old sub-

<sup>1</sup> Cf. Leonard Bloomfield, *Language*, 2nd ed., chapters 20-24.

<sup>2</sup> Cf. *supra*, p. 6.

<sup>3</sup> J. H. Randall, Jr., "The Development of Scientific Method in the School of Padua," this Journal, I, 2, 177-206; Philip P. Wiener, "The Tradition behind Galileo's Methodology," *Osiris*, I (1936), 733-46.

<sup>4</sup> *Erkenntnisproblem*, I (2nd edition, 1911), 136 f.



ject.” A work like the dynamics of Galileo could not come to birth all at once, like Athene from the head of Zeus. It needed a slow preparation, empirically as well as logically and methodologically. But to all these given elements Galileo added something completely new. No one before him had been able to make the kind of *use* of the “resolutive and compositive method” that Galileo made in his demonstration of the laws of falling bodies or in his discovery of the parabolic form of the trajectory. All this is wholly new and unique—and unique not only as a particular discovery, but as the expression of a scientific attitude and temper. For it is the significance and value attached to the mathematical method, not its mere content, that introduce a clear change over the fifteenth century.

That mathematics, to use Kant’s expression, is the “pride of human reason,” had never been seriously disputed since Plato’s time. Augustine likewise speaks with the greatest enthusiasm of mathematics and its “eternal truths,” which open to us an immediate entrance into the intelligible world. And even the idea of a mathematical science of nature by no means first originated in the fifteenth and sixteenth centuries. The necessity of a strictly mathematical treatment of optics was recognized, for instance, by Roger Bacon: “*Virtus efficientis et materiae sciri non potest sine magna mathematicæ potestate sicut nec ipsi effectus producti.*”<sup>5</sup> And we seem to find an anticipation of Galileo’s conception of causation when William of Ockham explains that no event can be regarded as the cause of another “*nisi per experientiam possit convinci ita scilicet quod ipso posito alio destructo sequitur effectus, vel quod ipso non posito quocumque alio posito non sequitur effectus.*”<sup>6</sup>

But all these analogies, to which might be added many others, prove nothing. Mathematics had been an *element* in culture long before the Renaissance; but in the Renaissance, with thinkers like Leonardo or Galileo, it became a new cultural *force*. It is the intensity with which this new force fills the whole intellectual life and transforms it from within that we should regard as what is significantly new. “He who scorns the very great certainty of mathematics,” says Leonardo, “is feeding his mind on confusion, and will never be able to silence the sophistical teachings that lead only to an eternal battle of words.” This is the conviction of Galileo also. For him mathematics is not one *field* of knowledge, but the only valid *criterion* of knowledge—the norm by which all else that is called knowledge is to be measured and before which it must pass its tests.

This new estimation of the value of mathematical physics rests on another

<sup>5</sup> *Opus Majus*, IV, II, i (ed. F. H. Bridges [Oxford, 1900] I, 110).

<sup>6</sup> Cf. Galileo’s *Saggiatore*, *Opere* (ed. Alberi), IV, 216: “Quella e non altra si debbe propriamente stimar causa la qual posta segue sempre l’effetto, e rimossa si rimuove.”

<sup>7</sup> Leonardo da Vinci, *Scritti letterari* (ed. J. P. Richter), No. 1157, II, 289.

underlying idea. In medieval philosophy we find a *bifurcation of knowledge*, which we meet first in Augustine and which then runs like a red thread through the entire history of scholasticism. It is the divorce between "*scientia*" and "*sapientia*." "*Scientia*" is the knowledge of "natural" things, "*sapientia*" the knowledge of "supernatural" things. *Scientia* is concerned with the "*regnum naturae*," *sapientia* with the "*regnum gratiae*." The unquestioned pre-eminence, the "primacy" of *sapientia* over mere *scientia*, is established for all medieval thinkers. "*Si ergo haec est sapientiae et scientiae recta distinctio*," says Augustine, "*ut ad sapientiam pertineat aeternarum rerum cognitio intellectualis: ad scientiam vero temporalium rerum cognitio rationalis, quid cui praeponendum sive postponendum sit, non est difficile judicare*."<sup>8</sup> According to this distinction any mathematical science of nature—if there is such a science—is a science of the created world; it can hence never claim a position equal to metaphysics and theology, the sciences of the eternal. "*Cognitio certitudinalis esse non potest nisi sit ex parte scibilis immutabilitas et infallibilitas ex parte scientiae. Veritas autem creata non est immutabilis simpliciter, sed ex suppositione, similiter nec lux creaturae est omnino infallibilis ex propria virtute, cum utraque sit creata et prodierit de non esse in esse*."<sup>9</sup>

All this is completely changed in Galileo. Mathematical physics is for him not merely a special branch of "science," it has become the tool, the necessary condition and instrument for any knowledge of truth. Without it there would be no truth for men. All "supernatural" truth which contradicts the conclusions of natural science or attempts to set limits to them is mere appearance. This was the new ideal for which Galileo fought—and it was this fight that led to his condemnation. For him mathematical physics had become a necessary element in his conception of life and of the world, in his interpretation of the universe.

What Galileo introduced and established is a new *hermeneutics*. The theological hermeneutics of the Middle Ages was in possession of the truth in the Holy Scriptures and in the interpretation of the Scriptures given by the Church Fathers. The humanistic hermeneutics knew and recognized no higher authority than that of the classical writers: the comparison of texts gave truth and "was" truth. All this Galileo dismissed with a few epigrams. "This kind of men believe," he wrote to Kepler, "that philosophy is a book like the *Aeneid* or the *Odyssey*, and that the truth is not to be found in the universe or in nature, but (and these are their own words) in the comparison of texts."<sup>10</sup>

<sup>8</sup> Augustine, *De trinitate*, XII, 15.

<sup>9</sup> Bonaventura, *Itinerarium mentis in deum*, *Opera omnia* (1882–1902), V, 293–316.

<sup>10</sup> See further details in my paper, "Wahrheitsbegriff und Wahrheitsproblem bei Galilei," *Scientia* (1937), 121–30, 185–93.

II. The like holds for Kepler's *Astronomia Nova*. It too is completely justified in its title—not only its contents but also its methodology is new. The first point is undisputed: without Kepler's laws Newton would not have been able to construct his system of the world or to write his *Principia*. But neither can the universal philosophical significance of Kepler's work be brought into question. In the recent literature on Kepler there seems to be a strong tendency to emphasize the "mystical" elements in his thought. That there are such elements, and that Kepler is much closer than Galileo to the Neoplatonic and Neopythagorean traditions, is unmistakable. But it is not only an exaggeration, it is absurd, when men like Dietrich Mahnke<sup>11</sup> try to derive his entire science from these ideas. "Mystical" ideas may well have had great influence on Kepler's personal attitude. We find clear traces of them in the *Mysterium Cosmographicum* and in the *Harmonia Mundi*. Even the belief in astrology Kepler seems never to have overcome fully—though he speaks with increasing detachment and often with a clear irony about his own astrological ideas.

But none of this is really significant. The real emancipation is accomplished in Kepler's work. And it could be accomplished there only because Kepler stood for a new and stricter *ideal of truth*. Kepler himself tells us that in his first studies of planetary motion he had arrived at an hypothesis which formulated all his observations with sufficient accuracy: the error amounted to only eight minutes, and in accordance with the prevailing opinion of the time could be neglected. But he was not satisfied, and went further: "These eight minutes," he himself says, "became the beginning of the whole new astronomy." It was thus a new demand for "precision" which gave birth to Kepler's laws. And so there grew up a new and stricter scientific critique of all pictorial and symbolic ideas, a clearer recognition of what symbols can and cannot do. "*Ludo quippe et ego symbolis*," Kepler says in a letter, "*sed ita ludo, ut me ludere non obliviscar. Nihil enim probatur symbolis; nihil abstrusi eruitur in naturali philosophia per symbola geometrica, tantum ante nota accommodantur, nisi certis rationibus evincatur, non tantum esse symbolica, sed esse descriptos connexionis rei utriusque modos et causas.*"<sup>12</sup>

III. In conclusion, I should like to touch briefly on another problem that has for some time been at the center of the "Renaissance controversy." Ever since Burckhardt set forth "the discovery of Nature and of Man" in

<sup>11</sup> Dietrich Mahnke, *Unendliche Sphäre und Allmittelpunkt: Beiträge zur Genealogie der mathematischen Mystik* (Halle, 1937). For criticism of this book cf. my article, "Mathematische Mystik und mathematische Naturwissenschaft," *Lychnos* (Annual of the Swedish History of Science Society, Uppsala, 1940), II, 248–65.

<sup>12</sup> Kepler, *Opera Omnia* (ed. Frisch), I, 378.

the Renaissance—ever since he explained that the Italian Renaissance was the age “in which Man became an intellectual *Individual* and recognized himself as such”—this thesis has been repeated countless times. Often the so-called “individualism” of the Renaissance has been used as a mere catchword. That this should have called forth the sharpest criticism is easy to understand. Huizinga once said that it is impossible to confine “individualism” to the Renaissance, since figures like Abailard, John of Salisbury, and Wolfram of Eschenbach remain outside its boundaries.

But it is clear that Burekhardt did not intend his thesis in this sense. What he was trying to say was that in the Age of the Renaissance the relative emphasis placed on the “universal” and on the “particular” began to shift. In the scale of values the individual was now assuming another place and another station. I am content to make this clear in a single case, that of Montaigne. Montaigne’s *Essais* created a new “philosophy” of the individual. That the portrayal of a particular man as a particular man—with all his peculiarities, accidents, and idiosyncrasies—could have a theoretical interest, was recognized by no philosophy before the Renaissance. The portrayal of men gave rise rather to types or “characters”—like the *Characters* of Theophrastus. Montaigne is the first thinker who dares to break with this tradition and who completes the break with full awareness of what he is doing. Augustine was able to set down his private confessions—but a portrait of himself in Montaigne’s sense would have seemed to him pure blasphemy. “*Les aultres forment l’homme,*” says Montaigne, “*je le récite et en represente un particulier, bien mal formé . . . Je ne puis asseurer mon object; il va trouble et chancelant, d’une yvresse naturelle: je le prends en ce poinct, comme il est en l’instant que je m’amuse à luy: je ne peinds pas l’être, je peinds le passage, non un passage d’aage en aultre, ou, comme dict le peuple, de sept en sept ans, mais de jour en jour, de minute en minute . . . Chasque homme porte la forme entière de l’humaine condition. Les aucteurs se communiquent au peuple par quelque marque speciale et étrangière; moy, le premier, par mon estre universel, comme Michel de Montaigne, non comme grammairien, ou poète, ou jurisconsulte . . . Au moins j’ay cecy selon la discipline, Que jamais homme ne traicta sujet qu’il entendist, ne cogneust mieulx que je fois celuy que j’ay entrepris; et qu’en celuy là je suis le plus sçavant homme qui vive.*”<sup>13</sup> That an author should dare to portray himself in all his peculiarities, particulars, accidents and idiosyncrasies—and that he should nevertheless claim for this portrait a *universal* significance: this is indeed something new with the Renaissance. The consideration of individuality thus acquires an entirely new value. It is no accident that Montaigne’s *Essais* was one of Shakespeare’s favorite books.

Our controversy as to the originality of the Renaissance and as to the dividing-line between the “Renaissance” and the “Middle Ages” seems to me in many ways rather a “logical” dispute than one about the historical

<sup>13</sup> Montaigne, “Du repentir,” *Essais*, Livre III, chap. 2.

facts. Ideas like "Gothic," "Renaissance," or "Baroque" are ideas of historical "style." As to the meaning of these ideas of "style" there still prevails a great lack of clarity in many respects.<sup>14</sup> They can be used to *characterize* and *interpret* intellectual movements, but they express no actual historical *facts* that ever existed at any given time. "Renaissance" and "Middle Ages" are, strictly speaking, not names for historical periods at all, but they are concepts of "ideal types," in Max Weber's sense. We cannot therefore use them as instruments for any strict division of periods; we cannot inquire at what temporal point the Middle Ages "stopped" or the Renaissance "began." The actual historical facts cut across and extend over each other in the most complicated manner.

Nevertheless the distinction itself has a real meaning. What we can express by it, and what alone we intend to express, is that from the beginning of the fifteenth century onward the *balance* between the particular forces—society, state, religion, church, art, science—begins to shift slowly. New forces press up out of the depths and alter the previous equilibrium. And the character of every culture rests on the equilibrium between the forces that give it form. Whenever therefore we make any comparison between the Middle Ages and the Renaissance, it is never enough to single out particular ideas or concepts. What we want to know is not the particular idea as such, but the importance it possesses, and the strength with which it is acting in the whole structure. "Middle Ages" and "Renaissance" are two great and mighty streams of ideas. When we single out from them a particular idea, we are doing what a chemist does in analyzing the water of a stream or what a geographer does in trying to trace it to its source. No one denies that these are interesting and important questions. But they are neither the only nor the most important concern of the *historian of ideas*.

The historian of ideas knows that the water which the river carries with it changes only very slowly. The same ideas are always appearing again and again, and are maintained for centuries. The force and the tenacity of tradition can hardly be over-estimated. From this point of view we must acknowledge over and over again that there is nothing new under the sun. But the historian of ideas is not asking primarily what the *substance* is of particular ideas. He is asking what their *function* is. What he is studying—or should be studying—is less the *content* of ideas than their *dynamics*. To continue the figure, we could say that he is not trying to analyze the drops of water in the river, but that he is seeking to measure its width and depth and to ascertain the force and velocity of the current. It is all *these* factors that are fundamentally altered in the Renaissance: the dynamics of ideas has changed.

<sup>14</sup> I have tried to analyze and clarify this character in a book that has just appeared, "Zur Logik der Kulturwissenschaften," *Schriften der Universität Gothenburg* (Gothenburg, 1942). A copy of the book is available in the Yale University Library.

Consider a case like that of Pico della Mirandola. In a study recently published in these pages<sup>15</sup> I tried to show that the *problem of freedom* lies at the center of Pico's thought. This is certainly no "new" idea. It belongs with the eternal questions of philosophy, which no philosophic thinker and no theologian can fail to reckon with. But what Pico makes out of this problem—the way in which he sets it in the focus of philosophic and religious concern and follows it as it radiates outward from this focus in every direction—all this was new and profoundly significant. Only this kind of *originality*, it seems to me, can be claimed for the Renaissance. Its great achievements lay much less in the new *content* it created—although that too is infinitely rich—than in the new *energies* it awakened and in the intensity with which these energies acted.

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## PREPARATION AND INNOVATION IN THE PROGRESS OF SCIENCE

BY FRANCIS R. JOHNSON

A question not directly touched upon by either Dr. Durand or Dr. Baron suggests itself in considering the relative importance of tradition and innovation in the history of Italian science of the fifteenth century—or for that matter, in the history of science of any period. It has to do with how far we are justified in denying originality and primary significance to those periods during which little apparent advance is made in scientific discovery, but which, upon more searching study, reveal themselves as periods of eager assimilation, dissemination, and elaboration of the body of scientific knowledge inherited from the distant and recent past, often with concurrent outside forces spurring men to re-examine the traditional material in a new light. Such periods of apparent quiescence seem to be customary preliminaries to those periods we regard as marked by spectacular innovations.

An apt analogy is the alternation, in a military campaign, of the rapid conquest of vast areas by spectacular advances in the field, with the no less necessary phase during which these advances are consolidated, old units regrouped, new forces brought up, and the ground prepared for the next forward lunge. The military strategist will usually rate this second, less spectacular, phase of a campaign as the more important, demanding greater skill. Unless it is successfully executed, seeming victory is transformed into stalemate or defeat.

Fifteenth-century Italy presents just such a period of consolidation and preparation in the history of science. Both Dr. Durand's and Dr. Baron's papers, emphasizing complementary aspects of recent scholarship, illustrate

<sup>15</sup> This Journal, III, 2 and 3 (April-June, 1942).

that our increased knowledge of the Quattrocento points to this sort of evaluation of its contribution to scientific thought. Dr. Durand, weighing its claims for innovation, rightly finds that its innovations, according to his helpful and lucid classification, consisted primarily in the internal elaboration of traditional substance rather than full mutations. Dr. Baron, on the other hand, justly asserting that the isolated study of the history of science frequently leads us astray, maintains that the Quattrocento's importance for science lies in its transformation of the cultural atmosphere in which scientists worked, and in the emergence of new ways of thought which promoted the mutational changes that were to come later. Thus, whether we fix our attention upon definite increments of scientific knowledge or consider science in relation to other material and intellectual activities, fifteenth-century Italy stands forth neither as a period of spectacular achievement in scientific discovery nor as one in which science was stagnant and neglected. Rather it is an era in which, at universities such as Padua, old material was being subjected to re-examination and elaboration, in which a closer co-operation between the scholar-scientist and the artist-craftsman was being evolved, and in which new political, economic, and social conditions were placing their impress upon scientific thought.

In these respects the conditions in fifteenth-century Italy were in many ways analogous to those in sixteenth-century England. Under the Tudors no great contributions, cited as landmarks in the progress of science, were made before Gilbert's *De Magnete* in 1600. But the entire century was one of alert and growing scientific activity, in which ancient science, as it became available in better texts, was critically re-examined; the manuscripts of medieval scientists like Bacon, Bradwardine, and Grosseteste—to name only English authors—were studied with fresh insight; and the new contributions of Vesalius, Copernicus, and others assimilated soon after they appeared.<sup>1</sup> A closer liaison between the systematized learning of the scholarly scientist and the technological skill of the artisan was fostered by men like Recorde, Digges, Dee, and Gilbert. The merchant companies, such as the Muscovy Company, became patrons and promoters of practical science, and employed some of the ablest scientists as expert advisers. Before the end of the century Thomas Hood, and later the Gresham College professors, were delivering public lectures on science, in English, to the tradesmen and artisans of London. Moreover, just as the fifteenth century in Italy prepared the way for the more obvious achievements of the next century and a half, so in England the sixteenth was the forerunner of Britain's greatness

<sup>1</sup> For studies of scientific activity in Tudor England see especially Sanford V. Larkey, "The Vesalian Compendium of Geminus and Nicholas Udall's Translation," *The Library*, 4th Ser., XIII (1933), 367-94; Francis R. Johnson, *Astronomical Thought in Renaissance England* (Baltimore, 1937); and E. G. R. Taylor, *Tudor Geography, 1485-1583* (London, 1930).

in the seventeenth, the century of Napier, Briggs, Harvey, Boyle, and Newton.

Unless we revive the mystical concept of scientific progress, long since discarded by most historians, which views it wholly in terms of the "un-analyzed creative intuitions" of individual geniuses, innovation will continue to appear, upon fuller investigation, less and less as a sharp break with the past. As our studies proceed, we are impressed with the number and complexity of the factors that must be already present, and in the right state of preparation, before some individual scientist, acting as a catalyst, produces the synthesis that we hail as a spectacular innovation. Galileo is a case in point. The studies of Duhem, Thorndike, and Randall, as Dr. Durand indicates, have minimized the absolute originality of Galileo by emphasizing his indebtedness to his predecessors. Leonardo Olschki, however, in a recent article, insists upon Galileo's originality and independence.<sup>2</sup> His case rests upon the claim that Galileo's transforming idea was a dynamic conception of all physical phenomena, opposed to the older conception of rest as the natural state of all bodies. But this transforming idea would, according to Dr. Baron's analysis, be merely Galileo's intellectual heritage from the Quattrocento, applied to scientific phenomena.

The Quattrocento, therefore, should be assigned a significance of its own in the complete history of science. We fail to do it full justice if, with Thorndike, we compare it adversely with the century that preceded it. Neither should we, because of its fewer positive contributions, rate it inferior to the age that followed. As transmitter and transmuted its rôle was just as indispensable as those of its predecessor and its successor. Its claims for primacy in the history of scientific thought, however, even when shifted from the no longer tenable ground of a sudden break with the middle ages, remain highly doubtful in the light of our present inadequate knowledge. The factors outside the immediate domain of science which Dr. Baron emphasizes so strongly in his reaffirmation of Italian primacy were equally operative in other countries such as England at a slightly later period and with similar results. Like factors may have had an important rôle as precursors of the scientific achievements of the thirteenth and fourteenth centuries in other countries of Europe. Our present information concerning medieval technology, for example, is so slight that it would be hazardous to assert that the architects and builders of the medieval cathedrals left an impress upon scientific thought less important than that produced by the artists and craftsmen of the Italian cities of the fifteenth century.<sup>3</sup> As we move forward in

<sup>2</sup> "The Scientific Personality of Galileo," *Bulletin of the History of Medicine*, XII (July, 1942), 248-73. Olschki's thesis is a restatement, for a more general audience, of that developed by A. Koyré in *Etudes Galiléennes*, (Paris, 1939).

<sup>3</sup> On medieval technology see the survey by Lynn T. White, Jr., "Technology and Invention in the Middle Ages," *Speculum*, XV (1940), 141-59; also his forthcoming article on "Natural Science and Naturalistic Art in the Middle Ages."



our studies of the history of science in relation to other aspects of civilization, the Quattrocento, as a period of consolidation of past scientific progress and preparation for the future will most likely be revealed as one of several similar periods in Western thought. As such it should be assigned no less importance, because no longer interpreted as unique.

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## THE PLACE OF CLASSICAL HUMANISM IN RENAISSANCE THOUGHT

BY PAUL OSKAR KRISTELLER

The "problem of the Renaissance," as it has been widely discussed in the last few decades, is largely a pseudo-problem. A complex historical period with a great variety of cross-currents, in which each European country and each field of interest underwent its own particular development, can hardly be interpreted in terms of a brief definition which would at the same time distinguish it from all other periods of history. Such definitions are apt to be too narrow or too broad. The discussion has been further complicated by the tendency of many scholars to take the Renaissance as an imaginary battle-ground on which to fight out contemporary political, social and ideological conflicts, or as a test case for the solution of such meta-historical questions as the possibility and the causes of historical change. On the other hand, there seems no doubt about the distinctive physiognomy of the Renaissance, and the claim that the very existence of "the Renaissance" has to be proved by a satisfactory definition of it, must be rejected. With the same right, we might as well conclude that there was no "eighteenth century," since we are unable to describe its distinctive characteristics in a brief definition. The best procedure would be rather to start with a tentative conception of the Renaissance, and to take this idea as a guiding principle when investigating the actual facts and sources of the period under consideration.

The question which Professor Durand sets out to answer is much more specific: what is the contribution of fifteenth-century Italy to the progress of natural science? I think the question is worth asking, and we must be grateful for the judicious way in which he has presented and evaluated the facts discovered through recent studies in the history of science. He rightly emphasizes the continuity of the university tradition, and at the same time recognizes the importance of the new translations from the Greek, as in the case of Ptolemy's *Geography*. Many other scientific translations, commentaries, and treatises of the fifteenth century are still awaiting a more detailed investigation, and many other branches of science and learning will have to be examined. But most probably Professor Durand's conclusion will be

confirmed, that fifteenth-century Italy brought no basic change in the methods and results of natural science, although it contributed numerous observations and theories in the various fields.

I disagree, however, with the conclusions for the general interpretation of the Renaissance Professor Durand seems to draw from this result. I fully agree with Professor Baron's excellent definition of the relation between the history of science and intellectual history in general, and his emphasis on the powerful influence which important changes in other fields eventually exercised on the development of natural science. The question of tradition and innovation in Renaissance science cannot be definitely settled without taking into consideration the non-professional writers on science, the non-Italian scientists, many of whom were more or less indebted to the Italians, and possibly even the scientists of the sixteenth century who largely reaped what the fifteenth century had sown. Moreover, science has not always occupied that dominating place among the other fields of culture which it has held during the last few centuries of occidental history. We cannot accept the claim that historical changes are unimportant unless they are changes in the field of science or immediately affect science. In the case of the Renaissance, the cultural change did not primarily concern science. Since Burckhardt's conception of the Renaissance is not based on any claim for a basic change in natural science, I do not see how it can be disproved by showing that actually no such basic change in science took place. On the other hand, I agree with Professor Baron that a change did take place in fields other than science, and that this change did influence the development of science, though indirectly and in a later period.

But when I try to answer the question, what kind of change was characteristic of the Renaissance, and especially of fifteenth-century Italy, I find myself less in agreement with Professor Baron than with Professor Durand. I do believe that classical humanism was, if not the only, certainly the most characteristic and pervasive intellectual current of that period. With its merits and with its limitations, humanism pervaded more or less all achievements and expressions of the fifteenth century. When its influence declined in the sixteenth century, its work had been already done. The influence of humanism on science as well as on philosophy was indirect, but powerful. The actual performance of the humanists in these fields was rather poor. But they popularized the entire body of ancient Greek learning and literature and thus made available new source materials of which the professional scientists and philosophers could not fail to take advantage. This was important, because at that time occidental science and thought had not yet reached or surpassed the results of classical antiquity, and hence had still something to learn from the ancients. Moreover, medieval science had developed in definite patterns, and the introduction of new sources and "authorities" eventually prepared the way for new methods and theories.

Those who claim that ancient science was completely known to the Middle Ages are as mistaken as those who deny that it was known at all. At least some of the classical Latin authors became more widely known in the Renaissance, Lucretius, for example. Numerous Greek manuscripts were brought over from the East, and more men were able to read them in the original. Moreover, practically all the Greek texts were translated into Latin by the humanists, many for the first time. The question of how many were translated for the first time and whether the new translations were better or more influential than the extant earlier translations, cannot be settled by dispute, but only by a careful bibliography of the Latin translations from the Greek, which should include the manuscript materials. In the field of philosophy, humanism introduced most of the works of Plato, Plotinus, Epictetus, Diogenes Laertius, Plutarch, Lucian, as well as many works of the commentators on Aristotle and of the Greek Fathers, not to speak of the Greek poets, historians, and orators. In science the contribution may be less impressive, but it has still to be investigated. Archimedes and Hero came at least to be more widely known, and many of the minor mathematicians were translated for the first time. The Latin translations were followed by extensive commentaries, and by translations into the various vernacular languages which reached an even wider public.

The humanists were certainly not the only representatives of science and learning in the fifteenth century. On the one hand, there were the followers of the medieval traditions who carried on the work of their predecessors, especially at the various universities. On the other hand, there were the artists and engineers who through their practical work came face to face with mathematical and scientific problems and sometimes made important contributions, as has been recently emphasized. But in the fifteenth century both of these latter groups were influenced by humanism, as was the general public. If the humanists failed to make substantial contributions to the various fields of traditional learning, they did introduce source materials and problems which could be applied to those fields. By the end of the fifteenth century, humanism had not indeed replaced the traditional learning, but the representatives of traditional learning had absorbed the achievements of humanism. This accounts for the changes and progress which took place in the sixteenth century—just as the achievements of the artists and engineers were taken over by the professional scientists after the middle of that century. On the other hand, even the artists and engineers were subject to the influence of humanism, as Professor Baron rightly emphasizes. The personal relations between the humanists and the artists need further investigation, especially as they appear from numerous letters and poems of the humanists which have not yet been utilized for this purpose. The number of artists and engineers who made active contributions to science was still comparatively small in the fifteenth century as compared with the

sixteenth. But the case of Leon Battista Alberti shows that this scientific activity of the artists cannot be separated from, or opposed to, contemporary humanism.

I cannot agree with those who identify these artists with the general public of the unlearned or who make a sharp contrast between the "Academic" humanists who wrote in Latin, and the "popular" writers who used the vernacular language. Those artists who also wrote scientific treatises certainly had some learning beyond that of the general public, and drew something from the professional learning of their time, whether it was in the medieval or in the humanistic tradition. The humanists themselves, no less than these artists, impressed the popular imagination of their time, as many anecdotes show. Since this was a matter of fashion, no real understanding on the part of the public was required. If today many admire the achievements of modern science without understanding its methods, we may well grant that in the early renaissance many admired the humanists without understanding their Latin. Moreover, the question of language is less important for our problem than might be supposed. In the fifteenth century there is abundant evidence for the mutual influence between vernacular and Neo-latin literature, and when the vernacular definitely won out in the sixteenth century, it had already absorbed the characteristic achievements of humanism, in style, terminology, literary form, and subject matter. Otherwise, it could not have replaced Latin.

To conclude, I should like to add to the statements of Professors Durand and Baron that by popularizing in the fifteenth century the works of classical antiquity, the humanists made an important, though indirect contribution to the development of science and philosophy, and that this contribution bore fruit not only in the work of the humanists themselves, but also in that of the professional scientists and artists of their time and of the following century. All these statements, however, are tentative rather than final, and subject to further revision. The only thing that really counts in Renaissance studies is the actual investigation of the extensive source materials which have not yet been included in any extant synthesis. This investigation must proceed with the cooperation of all scholars interested in the period, regardless of their point of view. In this study we should try to eliminate so far as possible our personal preference for or against this or that nation, language, class, current, or field, and to arrive at a fair evaluation of the contribution each of them has made to the whole of occidental civilization. Such an evaluation will not depend wholly on the influence, direct or distant, which each phenomenon has exercised on later developments, but will also acknowledge the inherent, "absolute" significance of many ideas and achievements which for some reason or other failed to have any visible influence. It is this significance, rather than any incidental

sequence of changes or influences, which in my opinion should be the ultimate purpose of the history of ideas, if not of all history.

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## IT IS TIME TO RECOGNIZE A NEW "MODERN AGE"

BY DEAN P. LOCKWOOD

Prof. Durand argues that "science is fundamental to the modern world," and that inasmuch as Quattrocento Italy made little or no advance in science, the Modern World owes less to the "Italian Renaissance" than is ordinarily supposed. Dr. Baron, commenting on this thesis, has shown, in my opinion, a far broader grasp of the period, and has demonstrated that some of the intangibles, some of the indirect results of intellectual forces, are far more important than Prof. Durand realized. All very interesting! But the most serious defect in Prof. Durand's reasoning is that he fails to define the "modern world." He does not take into account the fact that a *new* Modern Age is well under way.

We are at the beginning, I say, of a new era—the era of the annihilation of global space. It is an era so different from all previous human experience that it will be marked by the most important cleavage in recorded history. It is in this new era, beginning approximately with the twentieth century, that "science is fundamental." To call the Renaissance a prelude to this age is absurd, and to re-define the Renaissance in terms of twentieth-century values is beside the point. The Renaissance was prelude, in most ways that were then considered important, to the *ex*-Modern Age, the now nameless age, the period of the XIV–XIX centuries. We now need a handy designation for this recently-deceased era of western civilization.

Obviously the period since the Renaissance (the period commonly called the "Modern Age") could not have gone on being called the modern age forever. That term is, in the nature of the case, temporary. The Greco-Roman Era was once "the modern"; the Middle Ages were once "modern"; and now the period of the XIV–XIX centuries has receded into the past. It must be ticketed and laid on the shelf. (By the same token, the term "Middle Ages" is now automatically outmoded.) It is therefore time to recognize a new Modern Age.

Future historians may battle over the position of the nineteenth century. Should it be regarded as the last of the old era or the beginning of the new? From my preoccupation during the last few years with the history of medicine—and from the evidence of the "age of inventions"—I am inclined to speculate that the latter half of the nineteenth century will come to be regarded as of the New Era. But I am straying too far from the Renaissance.

The history of medicine—of which Prof. Durand has little to say—hardly supports the now popular theory of the superiority of the thirteenth century over the Renaissance. The evolution of the Science of Medicine is distinct from that of any other field of knowledge and has a simplicity and clarity all its own. Medicine, as we conceive it today—playing, as it does, a supreme rôle in modern life—begins in the nineteenth century. From the time of Vesalius there had, of course, been stirrings, and new forces were slowly gathering headway. But assuredly the medicine of all recorded time before the mid-nineteenth century (i.e., before the advent of antiseptic surgery, anaesthesia, physiological chemistry, *et al.*) falls into one major era.

The Italian Renaissance contributed nothing worth mentioning to the science of medicine. How could it? Renaissance means revival. From the point of view of modern medicine there was nothing in the Greco-Roman world worth reviving. And actually, in the fifteenth and sixteenth centuries, the Greek and Latin medical authors that were recovered and revived were no improvement on Avicenna. If Hippocratic or Galenic medicine had been fully revived in all its purity and perfection, there might have been a slight gain (counterbalanced by the loss of Arabic embellishments); but at best there would have been a difference of degree, not of kind.

The Italian physicians of the fifteenth century (and after) were medieval in their speculations and *primitive* in their practice. The utter abyss, the seeming lack of all connection between their complicated physical and methodological speculations on the one hand, and their pigeon-dung and scorpion-powder therapy for hot and cold, dry and moist, melancholic and phlegmatic “malcomplexions” on the other, is to the modern mind amazing and inconceivable. On the whole the Renaissance contributed nothing to modern medicine; neither did the Middle Ages; neither did the Greeks.

Therein lies just the difference between the attitude of the scientist and that of the humanist toward the Renaissance—or toward the whole past, for that matter! In the humanities—in art, in literature, in philosophy—we still go back to the Greco-Roman world, and to the Renaissance of the Greco-Roman world (and to the Middle Ages as well), for inspiration and even for guidance in the great problems of human life—moral, spiritual, and aesthetic; and we always will. But modern science looks to the past no more. It had its roots in the past, of course; but to trace them is merely to satisfy a curiosity, to pursue an intellectual hobby. The era in which “science is fundamental” has nothing to learn—in science—from the past.

I note an increasing tendency in the scientists of today to scorn the humanities, and to project their scorn of the humanities into the past. Thus past eras are re-evaluated with a new bias. If the classics, these scientists seem to say, are of no value today, how could they have been of value in the past? It is a dangerous argument. In the fifteenth century, when the

revival of classical attitudes was fresh, the classics were a potent force. If the results were indirect, they were none the less real; and Dr. Baron has made a masterly presentation of the subtler influences.

I believe that a more static interpretation of the past, by means of an effort to re-create the atmosphere of the past itself, is a sounder procedure than endeavoring constantly to re-interpret the past in accordance with every variation of contemporary thought.

Haverford College.

## RENAISSANCE OR PRENAISSANCE?

BY LYNN THORNDIKE

Professor Dana B. Durand has accused me of harboring a personal antipathy to the Renaissance. Whether my motive is personal or rational, objective or subjective, conscious or sub-conscious, it must be confessed that my aversion to the term in question is even more sweeping than Durand perhaps thinks and extends to such catchwords as the Carolingian Renaissance and the twelfth-century renaissance, as well as to the more often mentioned Italian Renaissance of the fifteenth century or somewhere thereabouts. Religion may have its resurrections and revivals, but I have even less faith than Nicodemus in rebirths or restorations of whole periods of human history. I take my stand with the blind writer of Christian hymns, Fanny Crosby, who sang,

But the bird with the broken pinion never soared so high again;  
with William Muldoon who said of former heavy-weight champions,  
They never come back;

with Omar Khayyam who mused,  
The moving finger writes and having writ  
Moves on; nor all your piety nor wit  
May lure it back to cancel half a line  
Nor all your tears wipe out one word of it;

and with a verse from the light opera, *Tom Jones*,  
Time is not a necromancer;  
Time's a thief and nothing more.

Legacies from the past? Yes. Inheritances from previous periods? Yes. Survivals? Yes. Resemblances to our forebears? Yes. Reformations? Perhaps. Reactions? Unfortunately. But no rebirths and no restorations!

Books and works of art are about all that remains to us of the past. The latter are all too soon sadly altered, and their restoration, whether by some German professor or by a Thorwaldsen or Viollet-le-Duc, only makes them less like what they originally were. Books remain less changed by the lapse

of time, but even their text may become corrupt, or the meaning of the very words they use alter in the interim. The humanists of the so-called Italian Renaissance had only a bookish knowledge of antiquity; they failed almost as dismally as have Mussolini and his Fascists to make the reality of ancient Rome live again. If, even in our own day, all the resources of the art of history aided by archaeology can give us only a faint and imperfect idea of the past, how can we expect actual renaissances of it or recognize them as such, if they were to occur? At the age of sixty I am perhaps more like myself at the age of twenty than I am like anyone else. But I couldn't possibly put myself back into the frame of mind that I had then. I have a dim recollection of it; my present state of mind is an outgrowth of it; that is all. A girl of eighteen, dressed up in the clothes which her grandmother wore when a girl of eighteen, may look more like her grandmother as she was then than her grandmother herself does now. But she will not feel or act as her grandmother felt and acted half a century or more ago. Much more tenuous is the connection between distant historical periods, and much less likely is it that historians can successfully venture upon glittering generalities about them. Who can evoke from the past more than a wraith, a phantasy, a specter, which murmurs, like the ghost in *Hamlet*, "Historian, remember me!"

It is true that history offers examples of human customs which somewhat resemble the conception of a renaissance. For instance, at Tonalamatl in ancient Mexico the recurrence of the year date 2. acatl every 52 years was considered a critical occasion, it being feared that the sun might fail to rise next day and that the evil spirits might destroy the world and mankind. Accordingly, a festival of ceremonial fire-making was held. All the old fires were carefully extinguished and at midnight on the mountain top the high-priest by rubbing sticks together kindled a new fire on the breast of a prisoner who was forthwith sacrificed. The new fire was then distributed to the temples of the surrounding cities and thence to the adjacent peoples. Old garments were thrown away and household dishes and utensils were broken or freshly painted over in token of the new lease of life given to mankind.<sup>1</sup> But this rekindling and renewal was immediate, continuous, and perfunctory. Only a part of one night intervened between the two periods, not centuries of dark ages. There was no intellectual or spiritual rebirth.

We might also adduce the influence upon our notions of revolutions and periods in history of the astrological theory of conjunctions and revolutions of the planets.

But let us turn to the development of the concept of an Italian Renaissance and begin with the translation into Latin of Ptolemy's *Geography* in the first decade of the fifteenth century. Durand is inclined to censure the previous medieval translators for neglecting this work. If they did—for a

<sup>1</sup> Joyce, *Mexican Archaeology* (1914), 74.



previous translation may have escaped our notice—it is to be remembered that after all the text in question consists largely of lists of ancient place-names, many of which cannot be identified and located with any assurance and are of purely historical and linguistic interest. Moreover, Ptolemy had made the Mediterranean Sea too short by one-third, whereas one of the medieval *portolani* is more accurate than any other map of the Mediterranean until the eighteenth century. Concerning the Far East, too, and islands in the Atlantic the thirteenth and fourteenth centuries were much better informed than Ptolemy. The translation and subsequent vogue of his *Geography* were therefore in some ways regrettable. Be that as it may, in the dedication of his translation to pope Alexander V, Jacobus Angelus, who was a booster of his native town of Florence, says:

This very age of ours, especially in our city of Florence, has sparkled with how many wits, who to their great glory have resuscitated liberal studies which had grown almost torpid.

In the fifth volume of *A History of Magic and Experimental Science* I have given various examples of this notion of a resuscitation of liberal studies becoming stereotyped and being extended to most inappropriate fields, such as astronomy by Moravus and Santritter, chiromancy and physiognomy by Cocles, anatomy by Vesalius, and magic in the case of Antiochus Tibertus. Abstemius depicted pope Paul III as restoring astrology after it had lain in darkness, disrepute, barbarism and sordid squalor for many centuries past; Pena praised Charles, cardinal of Lorraine, for having resuscitated the prostrate mathematical sciences.<sup>2</sup> Just as the humanists who found manuscripts of the Latin classics in monasteries represented themselves as discovering the work in question and rescuing it from neglect and decay, saying nothing of the fact that the monks had copied it in Carolingian times and preserved it ever since, but leaving their own manuscripts when they died to some monastery as the safest place in which to keep them, so publishers who printed a text for the first time, even if it was a typical product of medieval scholasticism, represented themselves as snatching it from Gothic filth and dust and mildew and cobwebs and bringing it to the light of fairest impressions with the text carefully restored to its pristine purity and freed from barbarisms, when in reality they were very likely using a single inferior manuscript and neglecting a dozen older and superior versions.

When was the word, Renaissance, first used? Nicolaus Prucknerus or Prugner approached such usage when, in the preface to his re-edition of the ancient Roman astrologer, Julius Firmicus Maternus, addressed from Strasbourg on January 28, 1551, to young king Edward VI of England, he spoke of religion reviving in that realm (*una cum renascente religione istius regni*). But evidently he was speaking of the Protestant Reformation.

<sup>2</sup> *A History of Magic and Experimental Science*, V, 334–5, 52–3, 524 and 530, 55, 265, 304.

Two years later, however, the French naturalist, Pierre Belon, in the dedicatory epistle of his *Les observations . . . de plusieurs singularitez* to François cardinal Tournon, assured him that, as a result of his patronage of learning and education of promising young scholars, it had followed that the minds of men, which were formerly as it were asleep and sunk in a profound slumber of long-standing ignorance, had begun to awake, to come forth from the shadows where they had so long dwelt, and to develop in all sorts of good disciplines a happy and desirable Renaissance, like plants that, after the rigors of winter, regain their strength with the sun and sweetness of springtime.<sup>3</sup>

Peter Ramus, in an oration delivered in 1546, made the following vivid contrast between his own and the preceding century. Suppose, he said, a master of a century ago should return to life now, what progress he would discover, how astounded he would be! He would be as surprised as one who, risen from depths of earth, should see for the first time sun, moon and stars shining bright. For then he heard no one speak except in a barbarous and inept manner, while now he would hear countless persons of every age speaking and writing Latin correctly and ornately. Then no one could read Greek, now men not only read it but understand it thoroughly. He used to hear as grammarians, poets and orators, Alexander of Villa-Dei, Facetus, the *Graecismus*; in philosophy, Scotists and followers of Petrus Hispanus; in medicine, the Arabs; in theology, I know not what upstarts. Now he would hear Terence, Caesar, Virgil, Cicero, Aristotle, Plato, Galen, Hippocrates, Moses and the prophets, the Apostles and other true and genuine messengers of the Gospel, and indeed voices in all languages.<sup>4</sup>

Except for the closing allusions to vernacular translations of the Bible, this passage well expresses the original restricted significance of the Renaissance as a purification of Latin diction and grammar, a revival of Greek, and a return from medieval compilers, commentators and originators to the old classical texts. This was all that the revival of learning meant to the Italian humanists of the quattrocento and to their fellows beyond the Alps, and for them it was enough. The mere thought of it aroused in Ramus a

<sup>3</sup> Edition of Paris, 1553, printed by Benoist Prevost, rue Prementel: "De la est ensuivy que les esprits des hommes qui auparavant estoient comme endormis et detenuz assopiz en un profond sommeil d'ancienne ignorance ont commencé à s'esveiller et sortir des tenebres ou si long temps estoient demeurez ensueliz et en sortant ont iecté hors et tiré en evidence toutes especes de bonnes disciplines lesquelles à luer tant eueuse et desirable renaissance, tout ainsi que les nouvelles plantes apres saison de l'hyver reprennent leur vigueur à la chaleur du Soleil et sont consolées de la douleur du printemps."

<sup>4</sup> For the Latin of the passage, which I have rendered freely, see K. Waddington, *Ramus, sa vie, ses écrits* (1858), 304-5. For a very similar attitude by Giovanni Ferrerio, in an academic dissertation published at Paris in 1539, see *Magic and Experimental Science*, V, 295.

grand and glorious feeling of enthusiasm tempered with complacency. He neither sensed any change in the political and economic set-up nor was aware of any alteration in social and moral values.

As the study and reading of Latin and Greek waned, however—and this was partly because the humanists and classicists had substituted a dead for a living language—fewer and fewer persons could sincerely share in this thrill or impart it to others. Such fervor as the concept of the Renaissance still invoked was largely in the realm of the fine arts, where the term had been applied to the post-Gothic period. It was at this juncture that Michelet called the Renaissance “the discovery of the world and of man,” and was followed in this lead by the very influential book of Burckhardt, in which, on what seem too often to be dogmatic or imaginary grounds without sufficient presentation of facts as evidence, the Renaissance was no longer regarded as primarily a rebirth of classical learning and culture but rather as a pre-birth or precursor of present society and of modern civilization—“a period,” to quote the *Boston Transcript* (February 27, 1926) concerning Elizabethan England, “that witnessed the birth pangs of most that is worth while in modern civilization and government.”

This made a well-calculated appeal to the average reader who is little interested to be told that Erasmus was a great Greek scholar or that Leonardo da Vinci copied from Albert of Saxony, but whose ego is titillated to be told that Leonardo was an individual like himself or that Erasmus's chief claim to fame is that he was the first modern man—the first one like you and me. All this was quite soothing and flattering and did much to compensate for one's inability to read Horace or to quote Euripides. It even had its appeal for professors of modern European history and for teachers of the modern languages. It appears to be the concept of the Renaissance which such recent advocates thereof or apologists therefor as Wallace K. Ferguson and Hans Baron are concerned to defend, retreating to new standing ground of plausible hypothesis and ingenious conjecture, when some of Burckhardt's old bulwarks are proved to be untenable by new masses of facts concerning either or both the middle ages and the quattrocento. But would it not make things clearer, if they ceased to employ the old name, since the old concept has been abandoned, and, instead of talking of the Renaissance, spoke of the period or movement or whatever it is they have in mind as the Prenaissance?

With regard to the work of Burckhardt I may perhaps be permitted a few further comments. Of its six parts, the third on the Revival of Antiquity seems to me scholarly and just, recognizing the defects as well as the merits of the Italian humanists and containing many bits of illuminating detail. But most of the political, social, moral and religious phenomena which he pictures as Renaissance seem almost equally characteristic of Italy at any time from the twelfth to the eighteenth century inclusive. The fourth part on the discovery of the world and man uses only popular, not scientific literature, nor may this be dismissed as merely a sin of omission, since else-

where in the volume are such atrocious misstatements as that few works of Aristotle had been translated into Latin by the fourteenth century. By including such personalities as Frederick II and such authors and literary compositions as Dante and the *Carmina burana* within the Renaissance, Burckhardt freed the movement from the embarrassment of chronological limits and made any differentiation between it and medieval culture well-nigh impossible. At bottom this was a wholesome tendency, equivalent to recognition that there is no dividing line between "medieval" and "renaissance" culture, just as most historical museums have a single section labeled "Middle Ages and Renaissance." In general, Burckhardt devoted so much of his pages and energy to the attempt to trace intangibles, such as personality, imagination, passion, spirit, the popular mind, the feeling for this and that, such and such a sentiment, that his book hardly touches the domain of intellectual history and seems to possess a will-o'-the-wisp sort of character.

The attraction which this kind of writing has for many has been well expressed by Professor Schevill in reviewing another book:

If the modern scientific method, a well co-ordinated plan, and the view-point regarding the character of the social process which obtains among present-day scholars are the indispensable requirements of a good history, it would have to be conceded that Mrs. Taylor's book stands self-condemned. But if there is salvation outside the ruling formulas, if a work may still be history, and good history, when, instead of building up a solid edifice of facts, it occupies itself with the spirit behind the facts in the hope of communicating the color and perfume of a segment of human experience, this book can be confidently recommended not only to the notoriously unscientific lovers of the Renaissance but to those grave and reverend signors, the professional historians themselves.<sup>5</sup>

The trouble is that this kind of writing is almost invariably based upon an insufficient acquaintance with the facts and misinterpretation of them. Of the same genus is another *bête-noire* of mine, those writers who proclaim that this or that person was far in advance of his time, like Roger Bacon or Leonardo da Vinci.<sup>6</sup> But should you ask them to name a few contemporaries of the person in question who were typical of that time, they would hardly be able to do so.

Was the individual freed and personality enhanced by the Renaissance or Prenaissance? Burckhardt affirmed that with it "man became a spiritual individual and recognized himself as such," whereas "in the middle ages both sides of human consciousness—that which was turned within as that which was turned without—lay dreaming or half awake beneath a common veil." It might be remarked that individualism may be a mark of decline

<sup>5</sup> Review of Rachel Annand Taylor, *Aspects of the Italian Renaissance: American Historical Review*, XXIX (October, 1923), 122.

<sup>6</sup> Durand has recognized this antipathy, too, in reviewing my fifth and sixth volumes in *Isis*, XXXIII (June, 1942), 691-712, especially 702-3, 704-6.

rather than progress. The self-centred sage of the Stoics and Epicureans rang the knell of the Greek city-state. Basil, on the verge of the barbarian invasions, complained that men "for the greater part prefer individual and private life to the union of common life."<sup>8</sup> Carl Neumann held that "true modern individualism has its roots in the strength of the barbarians, in the realism of the barbarians, and in the Christian middle ages."<sup>9</sup> Cunningham believed that the Roman Empire "left little scope for individual aims and tended to check the energy of capitalists and laborers alike," whereas Christianity taught the supreme dignity of man and encouraged the individual and personal responsibility. Moreover, in the thirteenth century there were "fewer barriers to social intercourse than now."<sup>10</sup> According to Schäfer, "So far as public life in the broadest sense, in church and state, city and country, law and society, is concerned, the middle ages are the time of most distinctive individuality and independent personality in volition and action."<sup>11</sup> We may no longer think of the Gothic architects as anonymous, and de Mely discovered hundreds of signatures of miniaturists hidden in the initials and illuminations of medieval manuscripts.<sup>12</sup> No period in the history of philosophy has discussed individuality and its problems more often or more subtly than did the medieval schoolmen. Vittorino da Feltre and other humanist educators may have suited their teaching to the individual pupil; at the medieval university the individual scholar suited himself. The humanists were imitative in their writing, not original. Vitruvius was the Bible of Renaissance architects who came to follow authority far more than their creative Gothic predecessors. For the middle ages loved variety; the Renaissance, uniformity.

Not only has it been demonstrated that the thirteenth and fourteenth centuries were more active and penetrating in natural science than was the quattrocento,<sup>13</sup> but the notion that "appreciation of natural beauty" was "introduced into modern Europe by the Italian Renaissance"<sup>14</sup> must also be abandoned. Burekhardt admitted that medieval literature displayed sympathy with nature, but nevertheless regarded Petrarch's ascent of Mount

<sup>7</sup> English translation (1890), 129.

<sup>8</sup> *Hexaemeron*, VIII, 7.

<sup>9</sup> "Byzant. Kultur u. Renais. Kultur," *Historische Zeitschrift*, XCI (1903), 215-32; translated in Munro and Sellery, *Medieval Civilization*, 524-46.

<sup>10</sup> *Western Civilization in Its Economic Aspects*, II (1910), 8 et seq., 2.

<sup>11</sup> "Zur Beurtheilung des Wormser Concordats," *Philos. u. Hist. Abhandl. d. kgl. preuss. Akad. d. Wiss.* (1905), 94.

<sup>12</sup> F. de Mely, *Les primitifs et leurs signatures: les miniaturistes* (1913).

<sup>13</sup> In addition to the bibliography given by Durand may be noted "Science in the Renaissance," by George Sarton, in *The Civilization of the Renaissance* (Chicago, 1929), 75-95. As Dr. Sarton remarks, "From the scientific point of view the Renaissance was *not* a renaissance."

<sup>14</sup> J. E. Spingarn, *A History of Literary Criticism in the Renaissance* (1899), 226.

Ventoux (which is only 6260 feet high) in 1336 as epoch-making. Petrarch represented an old herdsman who had tried in vain to climb it fifty years before as beseeching him to turn back on the ground that he had received only torn clothes and broken bones for his pains and that no one had attempted the ascent since. As a matter of fact, Jean Buridan, the Parisian schoolman, had visited it between 1316 and 1334, had given details as to its altitude, and had waxed enthusiastic as to the Cevennes. So that all Petrarch's account proves is his capacity for story-telling and sentimental ability to make a mountain out of a molehill. Miss Stockmayer, in a book on feeling for nature in Germany in the tenth and eleventh centuries, has noted various ascents and descriptions of mountains from that period. In the closing years of his life archbishop Anno of Cologne climbed his beloved mountain oftener than usual.<sup>15</sup>

As for the feeling for nature in medieval art, let me repeat what I have written elsewhere anent the interest displayed by the students of Albertus Magnus in particular herbs and trees.<sup>16</sup>

This healthy interest in nature and commendable curiosity concerning real things was not confined to Albert's students nor to "rustic intelligences." One has only to examine the sculpture of the great thirteenth-century cathedrals to see that the craftsmen of the towns were close observers of the world of nature, and that every artist was a naturalist too. In the foliage that twines about the capitals of the columns in the French Gothic cathedrals it is easy to recognize, says M. Mâle, a large number of plants: "the plantain, arum, ranunculus, fern, clover, coladine, hepatica, columbine, cress, parsley, strawberry-plant, ivy, snap-dragon, the flower of the broom and the leaf of the oak, a typically French collection of flowers loved from childhood."<sup>17</sup> *Mutatis mutandis*, the same statement could be made concerning the carved vegetation that runs riot in Lincoln cathedral. "The thirteenth-century sculptors sang their *chant de mai*. All the spring delights of the Middle Ages live again in their work—the exhilaration of Palm Sunday, the garlands of flowers, the bouquets fastened on the doors, the strewing of fresh herbs in the chapels, the magical flowers of the feast of Saint John—all the fleeting charm of those old-time springs and summers. The Middle Ages, so often said to have little love for nature, in point of fact gazed at every blade of grass with reverence."<sup>18</sup>

<sup>15</sup> Gertrud Stockmayer, *Über Naturgefühl in Deutschland im 10. und 11. Jahrhundert* (1910), 38 *et seq.* For further bibliography on feeling for nature in the middle ages consult Paetow, *Guide to the Study of Medieval History* (revised edition, 1931), 463, which, however, does not mention B. Q. Morgan, *Nature in Middle High German Lyrics* (1912).

<sup>16</sup> *Magic and Experimental Science*, II, 536-37.

<sup>17</sup> Émile Mâle, *Religious Art in France in the Thirteenth Century*, translated from the third edition by Dora Nussey (1913), 52.

<sup>18</sup> *Ibid.*, 53.

It is not merely love of nature but scientific interest and accuracy that we see revealed in the sculptures of the cathedrals and in the note-book of the thirteenth-century architect, Villard de Honnecourt,<sup>19</sup> with its sketches of insect as well as animal life, of a lobster, two parroquets on a perch, the spirals of a snail's shell, a fly, a dragonfly, and a grasshopper, as well as a bear and a lion from life, and more familiar animals such as the cat and swan. The sculptors of gargoyles and chimeras were not content to reproduce existing animals but showed their command of animal anatomy by creating strange compound and hybrid monsters—one might almost say, evolving new species—which nevertheless have all the verisimilitude of copies from living forms. It was these breeders in stone, these Burbanks of the pencil, these Darwins with the chisel, who knew nature and had studied botany and zoology in a way superior to the scholar who simply pored over the works of Aristotle and Pliny. No wonder that Albert's students were curious about particular things.

Finally, can we accept the altered concept of a Prenaissance as the vestibule to modern times and seed-bed of the modern spirit? Chronologically, perhaps. But, aside from the circumstance that modern times and spirit seem at present to be swiftly shifting, are not our political, economic, charitable, educational and ecclesiastical institutions quite as much an outgrowth from medieval life? Without attempting here to argue this larger question, I would merely recall that medieval men coined the word, modern, and regularly spoke of themselves or the last generations of themselves as such. "Maurus, Matthew, Solomon, Peter, Urso are modern physicians through whom reigns the medicine of Salerno."<sup>20</sup> About 1050 Berengar of Tours was accused of "introducing ancient heresies in modern times";<sup>20a</sup> about 1108 Hugh of Fleury wrote his *Historia moderna*. "On all sides they clamor," wrote John of Salisbury in the twelfth century, "what do we care for the sayings or deeds of the ancients? . . . The golden sayings of the ancients pleased their times; now only new ones please our times."<sup>21</sup> When in the next century Robertus Anglicus composed his treatise on the quadrant, it was called *Tractatus quadrantis secundum modernos*. But then improvements were made in the quadrant and Robert's work became *Tractatus quadrantis veteris*.<sup>22</sup> Even scholastic philosophy had its *via moderna* as well as *via antiqua*.<sup>23</sup>

<sup>19</sup> Published in facsimile at London (1859), and Paris (1908).

<sup>20</sup> Epilogue to a *Regimen Salernitanum* in Sloane MS. 554, f. 155, at the British Museum; S. de Renzi, *Collectio Salernitana*, V, 139.

<sup>20a</sup> *Soc. Hist. Franc.*, 50 (1884), 75.

<sup>21</sup> Hauréau, *Notices et Extraits*, III, 216, quoting the *Entheticus*.

<sup>22</sup> Duhem, *Le système du monde*, III, 306.

<sup>23</sup> The ancients were the thirteenth-century thinkers before William of Ockham, the moderns his followers. See "modern" in the indices of *Magic and Experimental Science*, vols. II-IV, for other examples of medieval use of the word.

The concept of the Italian Renaissance or Prenaissance has in my opinion done a great deal of harm in the past and may continue to do harm in the future. It is too suggestive of a sensational, miraculous, extraordinary, magical, human and intellectual development, like unto the phoenix rising from its ashes after five hundred years. It is contrary to the fact that human nature tends to remain much the same in all times. It has led to a chorus of rhapsodists as to freedom, breadth, soaring ideas, horizons, perspectives, out of fetters and swaddling clothes, and so on. It long discouraged the study of centuries of human development that preceded it, and blinded the French *philosophes* and revolutionists to the value of medieval political and economic institutions. It has kept men in general from recognizing that our life and thought is based more nearly and actually on the middle ages than on distant Greece and Rome, from whom our heritage is more indirect, bookish and sentimental, less institutional, social, religious, even less economic and experimental.

But what is the use of questioning the Renaissance? No one has ever proved its existence; no one has really tried to. So often as one phase of it or conception of it is disproved, or is shown to be equally characteristic of the preceding period, its defenders take up a new position and are just as happy, just as enthusiastic, just as complacent as ever.

You may break, you may shatter the vase, if you will,  
But the scent of the roses will hang round it still.

Still lingers the sweet perfume of the Renaissance; still hovers about us the blithe spirit of the Prenaissance.

Columbia University.





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## MEDIAEVAL INTEREST IN INTELLECTUAL HISTORY

By LYNN THORNDIKE

THE object of this paper is to note three minor and probably unfamiliar, but nonetheless informing and convincing, instances of mediaeval interest in intellectual history.

On the last leaf of a manuscript of the fourteenth century, S. Michele, Murano, 104, in an older hand than the rest of the codex, are historical notes 'from the chronicles of Isidore Junior' (*De chronicis Isidori Junioris*)<sup>1</sup> to this effect. Under Emperors Constantinus and Constantius are placed Donatus, inventor of grammar and teacher of Jerome, and the death of Saint Anthony. Under Gratian and Valentinian are grouped the deaths of Basil and Ambrose, and the apostasy of Priscian (i.e., Priscillian). Under Valens and Theodosius come the death of Jerome and the bringing of the head of John the Baptist to Constantinople. There follow the deaths of Saint Alexius (who fled from his bride), Augustine and Donatus; mention of Justinian's legal work and of Saint Benedict; the Emperor Maurice and Pope Gregory ('doctor ecclesiae'); the Emperor Heraclius and Mohammed; Charlemagne's transfer of the empire to the Franks, with a description of his personal appearance; Otto's transfer of the empire from Gaul to the Germans; under the Emperor Conrad, the death of Hugh of Saint Victor; and under Frederick Barbarossa, the *Sentences* of Peter Lombard, the crusades, and Saint Bernard. Obviously, the person who jotted down these brief notes was about equally attracted by religious, political and intellectual history, and not in the least concerned with economic or social phenomena.

In another manuscript at Basel written at some time in the fourteenth or early fifteenth century after 1333, the latest date mentioned, at fols. 129v-130v, are notes concerning a few chosen intellectuals of the past. They begin with Fulgentius, who is said to have been born of noble Carthaginian stock and afterwards was made bishop of Ruspe (in North Africa). Cassiodorus was first a senator, later a monk, chancellor of Theodoric, king of Italy in the time of Justin the Elder. In the time of Valerianus flourished Basil, Gregory of Nazianzus and Gregory of Nyssa. The latter two seem to be both represented as brothers of Basil, born in Cappadocia, and educated at Athens. Plato wrote a book called *Memoria Platonis* which enables a man to know and remember whatever he has heard and read 'in the whole world.' Even truer and older is an *Art of Nigromancy*, also handed down by Plato, which the Toledans translated. Aristotle and certain Arabs composed an *Art of Alchemy*, which, too, the Toledans translated.

Herewith we pass on to the later Latin Middle Ages. Uguccio of Pisa published a book on the meaning of words and Apparatus on the *Decretum*. Our writer's mind, however, flits back to the subject of alchemy, and he notes that the alchemists say that gold, whether natural or artificial, does not last beyond the seventh testing, and they prove this by its effect, so that, if it is swallowed and

the heart is not made glad and it does not comfort certain animal forces, it is not true gold.

Gerard of Cremona was born in Cremona and went to Spain. He translated the *Almagest* and *Quadripartitum* and some 102 books of astronomy and all the natural works of Aristotle and, it is thought, the book *On Causes* which was first found at Toledo, where Gerard was a canon(?).<sup>2</sup> All these he translated from Arabic into Latin.

A certain Magnus (or, great man) of Segovia, a city of Spain near the Arabic frontier, translated the work of Aristotle on plants, and it is called the Segovian translation.<sup>3</sup>

Master Peter (Lombard), bishop of Paris, composed *Sentences* in the town of Paris. His brother was Gratian, a black monk of Bologna at S. Felice where he published the *Decretum*. They both knew a lot about sacred sources, but Gratian more. This Peter also composed a Gloss on the Psalter and the Pauline Epistles.

Petrus Comestor (here called *Manducator*) composed the *Historia scholastica*.

'Brother Albert the German (*teuthonicus*) of the Order of Preachers, once bishop of Ratisbon, while in the Order wrote on the *Sentences*. He taught many subjects, made many books both theological and physical, and in his day there was no one like him in science. Finally in 1280 A.D. on 15 November, at Cologne, where he held a *studium generale* until his death, he rested in the Lord. May his soul rest in peace! Amen.'

Our author then continues: 'These are excerpts from the *Speculum doctrinale*, part two, a work of Vincent on doctors of holy scripture. This Vincent was reader at Beauvais in the Order of Preachers.' But he would seem to refer to notices which follow concerning Esdras, the Septuagint, Pamphilus the martyr, Clement, Dionysius the Areopagite and another Dionysius mentioned by Jerome in *De illustribus viris*, Origen, Cyprian, Athanasius and other church fathers coming down to Bede, Alcuin, Lanfranc, Bernard of Clairvaux, and both Hugo and Richard of St Victor.

The third text, reproduced below in its original Latin, occupies five and a half columns in a manuscript at Munich of the fifteenth century: Codex latinus Monacensis 23,888, fols. 59r. col. a, to 60r, col. b (original numbering, 36-37). A separate paragraph is devoted to each name, which further stands out by being written in larger letters and underlined, while a blank space is left between each paragraph and that which follows. The abbreviated handwriting is at times hard to decipher, and it will be seen that the writer is not always correctly informed. It will be further noticed that Boethius and Hugh of St Victor are treated twice, perhaps by inadvertence, and that the name of Isidore is misspelled. The author would seem to have been a German.

BOETIUS Omnes libros quos habemus aristotilis transtulit de greco in latinum. Sed commentator eorundem librorum fuit arrues,<sup>4</sup> vir magnus inter saracenos, magnus philosophus. Commentator, i.e. glossator vel expositor. plato didascolus expositor eius fuit.

ARISTOTILES fuit magister et didascolus magni alexandri. Item Aristotiles composuit librum propleumatum et intitulavit eum propleumata aristotilis. propleuma vocatur *am rattersch*. In quo libro queritur de diversis, scilicet quare ebrii cadunt et quare appetitio mingere in aquis, et ceteris. Item compilavit librum de animabus.<sup>5</sup>

ARRUES<sup>6</sup> fuit maximus philosophus et magnus vir inter saracenos de occidivis partibus, quia fuit commentator et expositor librorum quos habemus aristotilis.

AVICENA de indictionibus et compositionibus anni. Et est liber naturalis de compositionibus anni quomodo annus componitur de quatuor partibus. multos subtiles libros composuit. Et fuit rex et sarcenus et ex affrica natus.

ALEXANDER DE VILLA DEI magister anno millesimo ducentesimo duodeno. Magnus alexander egregius atque magister doctrinale suum dedit esse legendum.

ALBERCHTUS MAGNUS et fuit episcopus Ratisponensis, doctor et magister sancti thome de aquino, fuitque monachus ordinis predicatorum et denique permansit episcopus usque ad mortem. Obiit autem colonie anno domini M<sup>o</sup> CC<sup>o</sup> lxxx<sup>o</sup> et ibidem iacet corporaliter scilicet colonie apud predicatorum. (fol. 59r, col. b).

AUGUSTINUS composuit encheridion<sup>7</sup> et deberet dici eucorision ab *eu*, quod est *bonum*, et *cicros* grece, quod est *manus* latine, quasi bonus liber manualis. Augustinus in libro questionum est liber octoginta trium questionum. Augustinus in libro, dicta pro mortuis habenda. Augustinus in libro de civitate dei est unum volumen continens xxii libros partiales, unus liber totalis.

IERONIMUS AD VOLUSTANUM<sup>7a</sup> de beato augustino sic inquit: Lege Dei est quicquid contigerit; Augustinum ignorasti.

BASILIIUS monachus et episcopus compillavit librum qui intitulatur exameron. Vocatur ab *ex*, quod est *sex*, et *meron*, quod est *dies*, quasi liber de operibus sex dierum, quia scripsit super capitulum primum genensis quod tractat de operibus sex dierum.

BOETIUS fuit latinus quia<sup>8</sup> omnes libros quos habemus aristotilis transtulit de greco in latinum, sed commentator eorundem librorum fuit arrues vir magnus et magnus philosophus inter saracenos de occidivis partibus. commentator, i.e. expositor vel glosator. compillavit librum de consolatu philosophico.

CONSTANTINUS de simplici medicina. fuit monachus ordinis benedicti de monte cassino, bonus medicus qui composuit pantegni, qui est liber theoreticus et practicus.

DYONNISIUS ariopagista natus de villa ariopago. pagus est villa dupliciter, inde venit paganus. Item composuit librum de divinis nominibus, Tres libros de divina ierarchia<sup>9</sup> et de angelica ierarchia et de ecclesiastica ierarchia. Multa enim in scripturis sacris de divinitate, de deo (fol. 59v, col. 1) et eius essentia et natura, et de ierarchiis<sup>10</sup> angelorum et de distinctione chororum angelicorum et officiorum; et ne mirum, quia hec omnia profert et didicit ex ore beati pauli, qui in tertium celum raptus huiusmodi archana vidit et dilecto suo discipulo narravit et revelavit. Nota antequam conversus fuit ad fidem per sanctum paulum tunc fuit athenis in grecia summus philosophus, sed post conversionem fuit discipulus sancti pauli in divinis scripturis. Et fuit missus per beatum petrum apostolum ad gallos — vocatur *die franzosen* — quos convertit. Et incepit parisiis primo predicare, ibi decollatus fuit, et adhuc corporaliter iacet ibi.

HUGO DE SANCTO VICTORE fuit commentator librorum sancti dyonisii.

EGIDIUS de roma fuit monachus augustiniensis.

GREGORIUS Nota tres sunt gregorii salva greca quos habemus in scripturis. Primus gregorius magnus. ille multa et magna scripsit in theologia et composuit moralia. Secundus dicitur gregorius nassacenus a nassato civitate in grecia ubi fuit episcopus, sed non tantum scripsit<sup>11</sup> sicut gregorius magnus. Tercius dicitur gregorius decimus, i.e., decimus nomine; tradidit decretales. Gregorius magnus composuit pastorale qui liber dicitur pastoralis cura.

RAYMO doctor parysiensis, bonus expositor epistolarum pauli.

HUGO CARDINALIS de ordine predicatorum floruit sub innocentio primo et sub fridrico primo. ille totam bibliam doctrina perlucida postillavit. Postillare, i.e. exponere, et venit (fol. 59v, col. 2) a *post* et *illa*, i.e. post illa nomina componit sensum suum.

HUGO DE SANCTO VICTORE composuit libellum qui intitulatur didascalicum. Dicitur autem didascopus ille qui informat aliquem in disciplina scientiarum. Vocatur quasi disciplinam dans *logo*, i.e. sermone. huiusmodi didascopus aristotilis fuit plato, aristotiles magni alexandri, gamaliel beati pauli, victorinus beati ieronimi, alquinus magni

karoli, seneca neronis maledicti imperatoris. de crudelitate neronis quere in longo partita hystoria de sancto petro.

HERMANNUS CONTRACTUS comes de feringen,<sup>12</sup> ut legitur in cronicis, composuit illam anthemam, Cum rex glorie. Cum in curru suo intraret rome in pallacium apostolici, alta voce decantavit, que in tantum apostolico placuit ut eam incantari in die pasce et sequentibus diebus dominicis usque ad festum penthacoste cantari constitueret. Eandem etiam anthemam, dum veheretur in basilicam sancti petri, decantavit, scilicet, Symon bar iona, et anthemam, O gloriosum, in ecclesia sancti pauli. illorum et aliorum canticorum ipse editor et autor fuit. vocatur *dichter* unde *anfacher*. Hee antheme numquam antea audite fuerant nisi quod ipse solus cantavit rome.

YSIDERUS libro de interpretacionibus nomine Ethimologiarum est unus liber totalis continens xxi libros partiales, in quo libro ethimologizat omnia nomina rerum. Ysiderus libro de summo bono: Rex, inquit, eris, si teipsum rexeris. Et philosophus primo pollicitorum dicit quod rationalis mens regali dominio regit appetitum. (*fol. 50 r, col. a*)

IOSEPHUS fuit iudeus sed christianus factus scripsit librum antiquitarum, et est liber recitans antiqua gesta.

INNOCENTIUS TERTIUS multa scripsit de officio misse.

MAMMETRACTUS est liber compositus pro expositione vocabulorum biblie et legendarum sanctorum et omeliarum, ymnorum et sequentiarum, et aliorum quamplurium. et exposuit singula vocabula que pars est et cuius declinacionis vel coniugacionis, si simplicia vel composita, et que quantitas sillibarum cuiuslibet, et sermones earundem. Et dicitur Mammetractus quasi tractus ex mannis sacre scripture iuvenibus proficere incipientibus lac potum prebens non escam, i.e. solidam doctrinam disputacionum divinarum misteriorum nescio non impositorum.

ORIGINES dicit Ieronimus quod origenes sex milia voluminum composuit quod ea viderit. Origenes excusat se non esse hereticum in libro qui vocatur apologeticus; ibi excusat se in multis que sibi impingabantur.

RABI MOYSES<sup>13</sup> Iudeus magnus philosophus et maximus inter iudeos.

REMIGIUS archiepiscopus fuit tamen (?) sed est civitas in Francia vocatur *rems* vocatur franciosch. baptizavit sanctum leonhardum et de sacro fonte levavit. fuit magnus doctor et scripsit super Matheum (et) quosdam libros alios biblie.

RABANUS fuit doctor barisiensis.

SCOTUS et appellabatur iohannes scotus episcopus et magnus doctor parisiensis. (*fol. 60r, col. 2*)

SOCRATES pphilosophus magnus gentilis.

THOMAS DE AQUINO fuit comes de una civitate nomine aquinus et est sanctus et canonizatus. scripsit unam partem super secundam sententiarum, et illa secunda pars divisa est in duas partes, quarum prima dicitur *prima secunde* et alia *secunda secunde*.

TULIUS fuit romanus eloquentissimus virorum et orator et rethor optimus.

THEOPHILUS anthiocene ecclesie septimus post petrum episcopus qui quatuor cro nicarum in unum post dicta compingens. Anthiocena ecclesia et civitas vocatur anthiochia, ubi petrus primo fuit sublimatus in kathedram. est magna civitas et quilibet episcopus ibi est patriarcha, et portatur ante eum crux aurea. Hec civitas situatur in regione sirie et est maior quam tota allimania et francia. Et (in)siria situatur iudea et gallilea tamquam saxoniam et elsatia in allemania.

This text from the Munich manuscript rather surprises one by the curtness with which it dismisses some names and the detail — anecdote or quotation or bibliographical note — which it gives concerning others. The arrangement of the names is roughly alphabetical, and one wonders what the motive or purpose was in putting them together. Possibly they relate to a collection of books in the writer's possession or to a library at his disposal. Perhaps they merely represent the authors known to him or whom he could recall to mind at the moment or in

whom he was most interested. At least his interest in them seems to have been primarily intellectual.

If we compare the memoranda in the three manuscripts, although their fields of intellectual interest seem in general similar, we find a considerable discrepancy in the particular authors and titles that are selected and cited. One lists Plato and Aristotle; another, Socrates and Aristotle. Donatus gives way to Alexander of Villa Dei; Uguccio of Pisa is replaced by Mammotrectus. The only names that all three have in common are those of Basil, Jerome, Augustine, Gregory the Great and Hugh of St Victor. Peter Lombard and Saint Bernard are in the first two lists but not in the third. However, in view of the brevity of the first memorandum and the fact that it came down only to the twelfth century, perhaps there is as much correlation between it and the other two as we could expect. Between the two fuller lists, one of which goes to the death of Albertus Magnus in 1280, while the other includes Aegidius Romanus who did not die until 1316, the discrepancy is more marked, although there is one rather striking resemblance in their mentions of two Gregories other than Gregory the Great, albeit only one of the two is identical in both. But the Basel manuscript is silent as to Aquinas, although he died in 1274, six years before Albertus. The writer in the Basel manuscript is also peculiar in his interest in alchemy and nigromancy, in Toledo and translators from the Arabic, yet he fails to mention Averroes, Avicenna and Constantinus Africanus, who appear in the Munich manuscript. He notes Fulgentius and Cassiodorus whom the Munich manuscript omits, but it has Boethius and Isidore whom he lacked.

Such discrepancies raise the question whether authors, whom we think of as standard and generally known, were actually in the manuscript age known to some readers but not to others. On the other hand, the range and variety of authors covered in these brief lists and memoranda attest the richness of mediaeval Latin literature and learning, the broad scope of reading that was available — somewhere and some time, if not everywhere and always for everyone — and also the idiosyncrasies and special interests and personal selections of individual readers and bibliographers.

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<sup>1</sup> The name, 'Isidorus Junior,' or 'Isidorus Minor,' seems to have been applied to a later continuation of the *Chronica maiora* or *Chronica minora* of Isidore of Seville, as the following three manuscripts at the Escorial suggest.

Escorial &. IV. 28. (fourteenth century), fols. 111–167: 'Incipit cronica sancti ysidori junioris cum quibusdam additionibus extractis de textu et istoriis biblie et de libro pauli orosii et de passionibus sanctorum, continens in se ipsa cronica sex etates seculi . . . usque in presentem diem que est in anno domini ab incarnatione 1335 tempore benedicti pape 12 residentis.'

Escorial R. III. 8 (fifteenth century), fols. 1–33: 'Incipit cronica sancti ysidori minoris cum aliquibus additionibus . . . / . . . Explicit opus vel Cronica ysidori de sex etatibus mundi. Deo gratias.' In this case the text goes only to the death of Frederick II.

Escorial S. I. 2. (thirteenth century), fol. 169 (the last leaf of the manuscript): 'Incipit cronica ysidori iunioris. Sex diebus rerum omnium creaturarum summam deus formavit. Primo die condidit lucem . . . / . . . Ptolomeus philometor regnat annis xxv. Hunc antiochus superavit. (es un fragmento y compendio del Chronicon de S. Isidoro, números 1–57, opp. VII, 64).'

Also in Vatican Palatine Latin Ms 230 is a *Chronicon* ascribed to 'Isidorus Junior Episcopus.'

Fabricius, *Bibliotheca latina mediae et infimae aetatis*, iv (1735), 538, 560, accused Josephus Pellerius of inventing Isidore Junior and making him a bishop of Zaragoza. But obviously someone other than Isidore of Seville continued his chronicles to 1250 and 1335, or (as the extracts of our manuscript would suggest) into the twelfth century.

In other manuscripts at the Vatican yet other works are attributed to Isidore Junior: Ottobon. Latin 945, *Liber contra Iudeos*; Palatine Latin 1357, fol. 137, *De terra*, opening, 'Terra est in media . . .'

<sup>2</sup> The reading of the abbreviation is uncertain.

<sup>3</sup> Evidently not the extant translation by Alfred of England or Sareshel.

<sup>4</sup> I.e., Averroes. The name is poorly written in the text and repeated in the margin.

<sup>5</sup> *De animalibus* may be intended rather than *De anima*.

<sup>6</sup> Again for Averroes.

<sup>7</sup> Or, *eucheridion*.

<sup>7a</sup> Presumably Volusianus, bishop of Carthage, who wrote a letter to Augustine, is meant. I find no letter of Jerome to him either in Hilberg's edition (*Corpus scriptorum ecclesiasticorum latinorum*, vols. 54, 55, 56) or in Migne.

<sup>8</sup> *Qui* was perhaps intended.

<sup>9</sup> The manuscript has the spelling *ierechia* in all three cases.

<sup>10</sup> Manuscript, *ierachiis*.

<sup>11</sup> Manuscript, *scripsi*.

<sup>12</sup> I.e., Veringen or Vöringen.

<sup>13</sup> I.e., Maimonides.



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## MEDIAEVAL MAGIC AND SCIENCE IN THE SEVENTEENTH CENTURY\*

BY LYNN THORNDIKE

ARISTOTLE had accepted four inferior elements below the sphere of the moon: namely, earth, water, air, and fire, but had distinguished the heavenly spheres from these as a fifth essence which was incorruptible. This view prevailed generally through the mediaeval period. In the middle of the fourteenth century, however, John of Rupescissa composed a work called 'The Consideration of the Fifth Essence.' In it he suggested that, as the heavens were an incorruptible fifth essence, so the corruption of the human body might be staved off by a quintessence extracted from each of the elements or from the mixed bodies of the animal, vegetable, and mineral kingdoms. He waxed especially enthusiastic over the fifth essence from antimony.

In the seventeenth century many still accepted the doctrine of four elements, while others reduced them to three or two, and Van Helmont went back to the hypothesis of Thales that everything was composed of water. Descartes, of course did not recognize any of the old four elements, his three being differentiated only in figure and motion. The doctrine that the heavens were incorruptible was more generally abandoned, and some identified them with fire, while others held that air also filled the heavens and was continuous with the sky. On the other hand, Caspar Bartholinus as late as 1697 estimated the height of the earth's atmosphere as hardly one mile, although he knew that its weight raises water thirty-two feet, and held that the precipitation from it was sufficient to supply all springs and rivers. He also still spoke of three regions of air, as had been customary through the sixteenth and seventeenth centuries, although in the thirteenth Michael Scot and Thomas of Cantimpré had listed seven. Five years before Bartholinus's book, Etienne Chauvin in his *Rational Lexicon* of 1692, had reduced the three regions of air to two, variously estimated as extending eight, forty or fifty miles above sea level. But he was sure that the loftiest mountains surpassed this height by many parasangs and reached the purest ether — a vague appellation which many applied to the substance of the heavens. For Chauvin, too, it was still an open question whether springs of water originated from precipitation or from the sea — a question much debated throughout the seventeenth century.

While the substance which fills the heavens came to be called ether rather than fifth essence, the conception of quintessences extractable from things about us, which John of Rupescissa had developed in the fourteenth century, was widespread among the alchemists and chemists of the seventeenth century, although they usually incorrectly ascribed it to Paracelsus or to Raymond Lull, under whose name one version of Rupescissa's treatise was current. His stress on antimony also marked the chemical manuals of the seventeenth century, and was

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long a bone of contention between the dogmatic school of medicine and the spagyrics, or advocates of the employment of chemical remedies. At Paris, where in 1566 a decree of the faculty of medicine was passed against the use of antimony, and where Gui Patin, who lived from 1601 to 1672, cursed it all through his correspondence and career, sixty-one members of the faculty signed in favor of antimony in 1653, and 92 out of 102 voted for it in 1666.

Incidentally, Patin was an ardent advocate of the practice of blood-letting which had continued through the mediaeval period, although he felt that it had been somewhat neglected in favor of polypharmacy and Arabic medicine. In 1633 a royal physician who had rheumatism was bled sixty-four times in eight months, and Patin had another patient bled thirty-two times for a continuous fever, and he was 'entirely cured, for which I praise God.' When Patin was summoned to attend Hobbes, the English philosopher was in such pain that he wanted to kill himself but refused to be bled on the ground that he was sixty-four and too old. But next morning he assented and was, according to Patin, much better in consequence, and after that — Patin said — they became great pals. But Patin was accused of responsibility for the death of Gassendi, who died at the age of sixty-three, by excessive phlebotomy in his last illness. On the other hand, Patin recounted with great satisfaction the death of La Brosse, head of the *Jardin du Roy*, who had contracted dysentery from eating too many melons and drinking too much wine — 'as usual,' adds Patin. He had his entire body rubbed with oil of yellow amber for four days, and then swallowed on an empty stomach a large glass of brandy with a little astringent oil. When this did no good, he took an emetic, but died as it was working. 'So vomited forth his impure soul that impure wretch, most expert in killing men!' He had refused to be bled, calling it the remedy of sanguinary pedants, and said that he would rather die. Patin added: 'The devil will bleed him in the other world, as one deserves who was a knave, an atheist, an impostor, a homicide, and a public executioner.'

Belief in marvelous virtues of gems, herbs, and animals had ever been a doughty ally, indeed one might well say, an integral part, of magic. Since no rational explanation of them could be offered in terms of the accepted science of the time, with its four elements and four primary qualities of hot and cold, moist and dry, they were accounted for in the Middle Ages either by the influence of the celestial bodies and their mysterious and incorruptible fifth essence upon terrestrial substances, or simply attributed to occult qualities and virtues, specific form, and the action of the whole substance. This conception of action by some occult quality was by no means universally abandoned in the seventeenth century. But revivers of the atomistic theory of Epicurus and Lucretius like Gassendi, advocates of a new method like Descartes, and adherents of the corpuscular philosophy of Boyle felt that it was a confession of weakness to resort to occult qualities in the explanation of natural phenomena, and that they could explain these marvelous virtues mechanically by the action of particles which were so subtle and tiny as to be intangible and invisible. Thrown off as effluvia, these infinitesimal particles entered the pores of such substances as exactly fitted them and thus effected by contact what had seemed to be action at a distance, as in the case of the mag-

net's attracting iron, the torpedo fish numbing one's arm, although touched only with the tip of a spear or ten-foot pole held in the hand, and the healing virtue of amulets worn about the neck or otherwise attached externally.

Resort was also had to spirits, not, however, in the sense of immaterial separate substances such as angels and demons, but of very subtle material fluids in the human and other bodies. Besides the four humors — blood, phlegm, choler, and bile — Galen had distinguished animal spirits connected with the brain, vital with the heart, and natural with the liver. Mediaeval alchemists further applied the term, spirits, to such substances as arsenic, quicksilver, sulphur and sal ammoniac. In the sixteenth century Telesio, in attacking the natural philosophy of Aristotle, not only relied on such spirits to explain bodily functions, but even accounted for intellectual and moral qualities by the difference between the spirits in heat, tenuousness and purity. In the seventeenth century Francis Bacon, although asserting that his method was 'at least new, even in its very nature,' continued this emphasis upon spirits. His favorite explanation of natural phenomena was that in all tangible bodies there are very fine, rarefied, subtle and invisible spirits, which are neither heat nor vacuum, air or fire, but differ from one another as much as tangible bodies do. They are almost never at rest and are easily dissipated, evaporate, infuse and boil away. They govern nature principally. Gems have in them fine spirits, as their splendor shows, and they may work upon the spirits of men to comfort and exhilarate them. The leaf of the herb burrage has 'an excellent spirit to repress the fuliginous vapor of dusky melancholy and so to cure madness.' Cats and owls could not see by night, were there not a little light, sufficient for their visual spirits. The reason why blows and bruises induce swellings is that the spirits rush to relieve that part of the body and draw the humors with them.

For William Harvey, the discoverer of the circulation of the blood, the spirits were never separated from the blood, but most authors of the century thought of the animal spirits as circulating through the motor and sensory nerves. On the other hand, Steno, during his stay in Paris in 1664–1665, in a discourse on the brain before Thévenot's circle, called the very existence of animal spirits into question. But in the main such spirits were accepted, along with effluvia, by even the advocates of an atomistic and mechanistic interpretation of nature, and were employed as a useful substitute for the conception of occult qualities and virtues.

It is true that there was an increasing tendency on the part of sceptical Epicureans like Gassendi to reject outright some of these reported marvelous virtues as false. Yet he did not question that shellfish fatten and that the marrow in the bones of animals increases with the waxing of the moon. He attributed it, however, not to an occult influence of the moon but to particles of moisture on the moon which are excited by sunlight and then borne by the sun's reflected rays to earth in greater number than at the time of the new moon. Similarly that sheep shun a wolf which they have never seen before is because the wolf sheds corpuscles which are offensive to the sheep. Or Gassendi repeats the statement of Lucretius that the reason why a lion is scared by the crowing of a cock is that the corpuscles emitted by the cock hurt the lion's eyes.

With all due respect to Lucretius and Gassendi, it must be said that more than one objection may be raised against this explanation. In the first place, what proof is there that the cock emits corpuscles? And if so, why should they be any more injurious than those emitted by the hen, especially when we think of fascination by witches, of the presence of a menstruating woman clouding a mirror, and that the female of the species is more deadly than the male? In the third place, why is it that these injurious effluvia are emitted only when the cock crows? In the fourth place, how and why do they injure the lion's eyes rather than his nose or ears or paws or mane? In the fifth place, why do Lucretius and Gassendi dodge the obvious explanation that the sound of the crowing startles the king of beasts, and adopt the extremely far-fetched theory that the effect of a noise is felt by an organ of vision? Anyone could readily think up a dozen more plausible explanations. But just so long as it is atomistic and corpuscular, it is good enough for Gassendi.

Aristotle and Pliny had told of the little fish called echeneis (ἑχέιν νῆας) of which a single specimen could bring a ship in full sail to a sudden halt by attaching itself to the keel. Pliny indeed had waxed eloquent on the subject as follows:

We have now arrived at the culminating point of the wonders manifested to us by the operations of Nature. And even at the very outset, we find spontaneously presented to us an incomparable illustration of her mysterious powers. . . .

What is there more unruly than the sea, with its winds, its tornadoes, and its tempests? And yet in what department of her works has Nature been more seconded by human ingenuity, than in this by the invention of sails and oars? We are further impressed by the ineffable power of ocean tides, as they constantly ebb and flow, and regulate the currents of the sea as though these were the waters of one vast river.

Yet a single fish, and that of very diminutive size — the fish known as the echeneis — can counteract all these forces, though acting in unison and impelling in the same direction. Winds may blow and storms may rage, yet the echeneis controls their fury, restrains their mighty force, and bids ships halt in their course; a result which no cables, no anchors . . . could ever have produced. A fish bridles the impetuous violence of the deep and subdues the frantic rage of the universe — and all this by no effort of its own, no act of resistance on its part, no act at all, in fact, except attaching itself to the keel.

Pliny goes on to tell how the flagship of Antony was thus halted at the battle of Actium, and more recently the five-banked galley of the Emperor Caligula.

With such specific confirmation of the authority of Aristotle, few ventured to question the truth of the statement. The church father Basil and Isidore of Seville quoted Pliny; William of Auvergne accepted it in the thirteenth century. Thomas of Cantimpré said that it had seemed incredible to many, but since Ambrose, Jacques, Aristotle, Isidore, and Basil all affirmed it, he did not see how there was any room left for doubt. Giovanni da Fontana continued credulous concerning it in the early fifteenth century. Giannini very much doubted it in the sixteenth century, despite the authority of Aristotle, Pliny, and Aelian, but the sceptic Sanchez accepted it without question, as did Gesner, Freige, and others. Pomponazzi suggested that the echeneis operated by occult virtue like the magnet; Fracastoro thought that it was merely a sign of the proximity of magnetic mountains which were the immediate cause of the ship's stopping; Cardan held that the echeneis attached itself to the rudder rather than the keel and wobbled it so

that the ship could not proceed. If true, Giannini could attribute the effect only to occult virtue. In the seventeenth century, of more than twenty authors whom I have examined, only three or four denied it. For Valerio Martini, it was still an example of occult virtue. For Francisco Torrelbanca of Cordova, it and the torpedo fish were unmistakable examples of magic, along with the magnet, asbestos, and ever-burning lamps found in ancient sepulchers. Campanella suggested that the echeneis stupefied the vessel and rendered it repugnant to its natural motion, as the bite of a mad dog makes its victim inhuman and canine. Gassendi discussed it for a full folio column and attributed the ship's stopping to an adverse current rather than the remora. Horst in 1682 wrote that the faculty by which the echeneis stopped ships was the contrary of that by which the magnet attracted iron. Henckel in 1690 could do no better than repeat the reasoning of the great Spanish schoolman Suarez in the previous century.

Some say that, as the hand of the thrower gives an impetus to the missile which keeps it going after it has left his hand, so the remora or echeneis imprints a non-impetus upon the ship which keeps it standing still. Others say that it detains the vessel by innate virtue, as a man holds a stone in his hand so that it cannot fall. Yet others say that it so attaches itself to the ship that it cannot be moved, nor can the ship. Suarez's own conclusion is that, however, it happens, there is no doubt that it comes from some marvelous and occult virtue, aided very likely by some special and connatural celestial influence.

Besides such occult virtue and celestial influence, sympathy and antipathy were an explanation of apparent magic and action at a distance to which resort was made as often in the seventeenth as in the mediaeval centuries, as the twenty-six treatises in the *Theatrum sympathicum* of 1662 bear witness and repeated reference to the conception by many other writers. Weapon ointment now commanded more attention and support than it had in the sixteenth century. Much discussed was the question whether the corpse of the victim would bleed at the approach of the murderer and only at his approach, a question ventilated by Nicole Oresme and Henny of Hesse in the fourteenth century and by Galeotto Marzio in the fifteenth. Indeed, Peter of Abano, the famous Conciliator, at the end of the thirteenth century in a passage of his Commentary upon the Problems of Aristotle, had given an explanation of the phenomenon which was repeated by Lazarus Gutierrez of the University of Valladolid in 1653 and which was perhaps both as ingenious and as probable as any that was offered. The slayer, by virtue of his fury and strong imagination, had impressed on his victim spirits of hostility aroused at the time of the crime and emitted from his — the slayer's — body. When the murderer reappears, these material spirits tend to return to his body where they belong. In doing so, they stir the corpse and draw blood from the wound with or after them. Others attempted to explain the bleeding corpse in terms of sympathy and antipathy.

The force of sympathy was also involved in the *Biolychnium* of Johann Ernst Burggrav. This Lamp of Life and Death was fed with a liquid made from human blood which burned as long as the blood-giver lived, went out when he died, and presumably flickered when he fell ill.

For such diseases as dropsy, jaundice, and leprosy, Burggrav gave the following prescription. Empty an egg and fill the shell with some of the patient's blood, then close the aperture with fish-glue. Place the egg under a setting hen for a fortnight, then feed it to a pig or a dog, and the disease will be transferred to the animal. Such transplantation or magic transfer of disease to plants and animals was much practiced in the seventeenth century, and many examples of it might be given.

Another example of the belief in sympathy then is had in the oft repeated tale of the grafted nose, which, when the original owner of the skin employed in the grafting died, rotted and fell off. Caspar Schott in 1665, however, cast doubt upon this story. He furthermore declared impossible the supposed sympathetic action of two compasses at a great distance from each other, or that friends after having mingled a little of their blood, could communicate from afar. If one of them pricked his skin, similar punctures were said to appear upon the body of the other.

In the fourteenth century William de Marra of Padua, in a work on poisons addressed to Pope Urban V (1362-1370), suggested as an explanation for hydrophobia that the patient shunned water because vapors from his eyes, infected with rabies, were reflected in the water and made him imagine that he saw there the dog which had bit him. William further referred to the belief that bits of flesh or fat resembling puppies appear in the patient's urine, and it was repeated by Christopher de Honestis and John Martin later in the same century. This latter notion persisted in the seventeenth century and is found as late as 1709 in Gar-mann's *De miraculis mortuorum*, although S. A. Fabricius had published a medical disquisition against it at Padua in 1665 and Meibomius and Gaspar à Reies had questioned it earlier. But Daniel Sennert (1572-1637), who for many was a great medical authority, had rung further changes and variations upon it, such as discussing whether and why images of dogs sometimes appear in the urine of mad dogs — rather than in that of the sufferer from hydrophobia, or repeating, as Frommann reminds us in 1675, upon the solemn assurances of trustworthy persons, that animals similar to small puppies are generated from the foam of mad dogs which has adhered to one's clothing.

William de Marra further remarked that the bite of the spider called tarantula was relieved by music, because its poison induced melancholy, for which the best antidote is rejoicing. The vulgar and ignorant say that the insect itself sings when it bites, and that, when the patient hears similar cadences, it is a great relief to him. William was unwilling to entertain this explanation, but he thought that it might be possible that the pleasure derived from the music attracted the spirits from within the body to its periphery and so prevented the poison from penetrating to the vitals. From a score of seventeenth century discussions of the bite of the tarantula, let us take for comparison that by Walter Charleton, an Oxford M.D. and Fellow of the Royal Society, who in 1654 published a résumé in English of the Epicurean or atomic natural science of Gassendi, whose discussion of the same matter it resembles but is longer and more detailed.

The bite of the tarantula makes a man 'dance most violently at the same time every year' as when he was bit, 'till he be perfectly cured thereby, being invincible

by any other antidote but Musick,' which affects the animal spirits in the brain and so the whole body and attenuates the poison 'by a way very like that of fermentation,' setting the patient to dancing until the venom is expelled by a profuse sweat. Different victims require different tunes and musical instruments to dance to, according to the type of tarantula that has bitten them and also according to their own temperaments. The melancholy needs drums, trumpets and sackbuts; the choleric and sanguine are cured by stringed instruments. The musicians of Taranto seek out a tarantula like the one which bit the patient, find out what tunes the spider will dance to, and then employ them with success upon the patient. But a French writer, Meyssonnier, added the caution that music availed not in the case of those who had drunk wine in which a tarantula had drowned.

The possibility of prolonging life to 120 years, or of renewing one's youth like the snake and the eagle, of discovering an alchemical elixir of life, or a fountain of youth in the New World, still occupied men's minds in the seventeenth century.

Francis Bacon seems to have been more interested in the prolongation of life and health than in the cure of disease. He thought that purges were more conducive to a long life than exercise and sweats were, arguing that perspiration drove out not only noxious humors but also good juices and spirits. On the other hand, frequent blood-letting might be beneficial by renewing the fluids of the body. He held that persons with long legs were likely to live longer than those with long trunks. He knew a great man who attained a long life and whose custom it was to have a fresh sod of earth brought to him every morning while he was still in bed, and he would hold his head over it for some time. Unicorn horn was rather out of favor when Bacon wrote, but the bezoar stone, gold and powdered pearls, emeralds or jacinths, were still highly regarded as promoting longevity. Among his own favorites were 'Grains of Youth' and 'Methusalem water.' The former comprised four parts of nitre, three of ambergris, two of orris-powder, one-quarter of white poppy seed, one-half of saffron, with water of orange blossoms and a little tragacanth. These ingredients were to be made into four small grains which were to be taken at four o'clock or upon retiring for the night. Methusalem water was the product of repeated washing, steeping, drying and pulverizing of shells, tops of rosemary, pearl, ginger, white poppy seed, saffron, nitre, ambergris, cucumbers sliced in milk and stewed in wine, vinegar, spirits of wine, and so forth. Bacon tells us that Frederick 'Barbarossa in his extreme old age' — he was not yet seventy when he died on the third crusade — by the advice of his Jewish physician applied young boys to his abdomen to warm and comfort it, and other old men 'lay whelps (creatures of the hottest kind) close to their stomachs every night.' Despite such nostrums, Bacon died at sixty-five.

Francisco Torreblanca of Cordova believed that old men might renew their youth, and that the phoenix lives to be five hundred years old, because it never indulges in sexual intercourse. He further assures us that the devil can enable a man to fast for a long time, for the chameleon, according to Pliny, has such a large lung that it can live on air alone, while about the year 1288 a girl had subsisted for thirty years on the eucharist alone. Similarly Athanasius Kircher in his *Mundus subterraneus* tells of a diver who spent so much time under water that a

web grew between his fingers like that on the foot of a duck, while his lungs became so distended that they contained a supply of air sufficient for an entire day.

Speaking of water of orange blossoms, it may be noted that Sir Isaac Newton breakfasted regularly on 'orange peel boiled in water which he drank' instead of tea, 'sweetened with sugar and with bread and butter. He thinks this dissolves phlegm,' we are told.

Such favorite phrases of late mediaeval scholasticism and of the pseudo-Lullian alchemical corpus as *calidum innatum* (innate heat) and *humidum radicale* (fundamental moisture) were abandoned by Caspar Bartholinus in the last decade of the seventeenth century. But the former phrase had been employed by Caimus in 1616, by Marcus Marci in 1635, Zaccagnini in 1644, Conring in 1647, and Hoffman in 1667; while *humidum radicale* was used by Bartoletti in 1619, William Harvey in 1651, and J. J. Becher, who at Munich had the finest chemical laboratory in Europe, in 1669. Earlier Jean d'Espagnet had described it as 'something immortal, which neither disappears with death nor is consumed by . . . the most violent fire, but remains unconquered in corpses and ashes.' In 1648 the French Jesuit, Etienne Natalis, said that the spirits contained in *humidum radicale* divided into material and formal parts, one elementary, the other, celestial.

It may seem a long cry from the seventeenth century back to the *Etymologies* of Isidore of Seville in the early seventh century. Yet, when Caspar Bauhin, noted primarily as a botanist, published two books on the nature of hermaphrodites and monstrous births from the opinions of theologians, jurisconsults, medical men, philosophers and rabbis, they were further described in the long Latin title as *plane philologici*. In a work on the salamander by Wurffbain in 1683, the opening chapter on whether such an animal existed was followed by other chapters upon its etymology, homonyms, and synonyms, before a word was said of its natural history and reputed living in fire, for which he listed fifty favoring authors and ten against this based upon experiment.

Wurffbain had first submitted his work to the German Academy of the Curious concerning Nature. This lead was promptly followed in a big way and petty manner by Christian Franz Paullini. His *Cynographia curiosa* or Description of the Dog was 'according to the method and laws of the illustrious Academy of the Curious as to Nature,' and was prefaced by letters of congratulation and recommendation by no fewer than thirty-six members of that society and twenty-five others. The work was in four sections: the first was philological-physical-anatomical; the second was about the sacred, political, economic, and satanic use of the dog; the third, chemical-medical; and the fourth, physico-medical. Paullini followed it up the very next year by a treatise on the toad which was also according to the method and laws of the aforesaid academy and which he dedicated to Wurffbain. It was in two sections: philological-historical-physical, and medical-practical. In it Thomas of Cantimpré's thirteenth-century story of the ungrateful son, goose, and toad is spun out at great length, Paullini recounts the spontaneous generation of the toad, its antipathy with the spider, tells of the toadstone (*Bufo nites*), that Norwegian pitch poisons toads, and questions whether the basilisk is produced by a toad sitting on the egg laid by a cock. The answer is:



Not ordinarily. From dog and toad Paullini proceeded to volumes on the sacred herb, salvia, mole, eel, hare, wolf, and ass. Judging from the three of these that I have examined, all follow a similar plan of presentation and profess to be according to the norm of the Academy. In that on the wolf there is a chapter upon its use in prodigies and portents. That on the ass includes chapters on asinine prodigies and omens, asinine dreams, asinine miracles and forecasts, pretended and superstitious ass-worship, superstitious use of the ass, and magical use of it.

After long hesitation, Athanasius Kircher felt obliged to admit the existence of flying dragons, as Roger Bacon had done in his day. Kircher tells of one with two feet and wings seen in Switzerland in 1619 and of another slain by a Roman hunter in 1660. Its head was brought to Kircher's museum, and it had had two feet like those of a goose, but, when found, it had already putrefied, while the hunter had died that night from its poison. Kircher further tells of a mediaeval winged dragon on the island of Rhodes with a poisonous breath, which had proved to be so invincible that the local king finally forbade anyone henceforth to attack it. Nevertheless a certain Deodatus de Gozano from Italy decided to make the attempt. In 1345 he constructed an artificial dragon and trained his horse and dogs to attack it, while his servants were provided with drugs to resuscitate him from the venom of the dragon's breath. Thus prepared, he returned to Rhodes to encounter the dragon. After the dogs had gallantly fulfilled their function, and the dragon, distracted by pain and chagrin, had reared up on its hind legs, thus exposing the vulnerable side of its body, the doughty Deodatus, putting spurs to his steed, charged in and delivered the *coup de grâce*. The king nevertheless imprisoned him for having disobeyed the ordinance, but the people murmured so that he was soon released and ultimately became the king's successor.

The statements of the Bible concerning natural phenomena and occult arts carried as much weight and created as great difficulties in the seventeenth century as they had through the mediaeval period. The account of creation in the Book of Genesis, the waters above the firmament, the sun standing still, the asp closing its ear to the incantations of snake charmers, how the carnivorous animals in Noah's ark were fed, the witch of Endor and apparition of Samuel, the feats of Pharaoh's magicians, the star of the Magi, the eclipse during the Passion, Behemoth and Leviathan, Jacob and the ewes, and Rachel and the mandrakes, were but some of the passages of Scripture that raised problems which were rehearsed once more in the seventeenth century. John Betts, royal physician in ordinary, Fellow of the London Medical College, and associated with Harvey, in a book of 1669 on the origin and nature of the blood, explained the 'cloven tongues like as of fire,' which appeared above the heads of the Apostles at Pentecost, as animal spirits or the fiery part of the blood which sometimes burst forth into flame. A book that was reviewed in *Philosophical Transactions* in 1665 held that Solomon had already been acquainted with the circulation of the blood. Becher, who was famous for his industrial inventions as well as for his chemical laboratory, assigned a large share in the process of creation to angels. He affirmed that they had produced both macrocosm and microcosm by arranging particles into 'the ideas of various species and bodies,' to which the remaining particles of matter were then attracted.

Paracelsus was much cited by the alchemists and chemists of the seventeenth century, but they also went back to mediaeval authorities such as Arnald of Villanova and Raymond Lull. Indeed, Duchesne or Quercetanus early in the century protested that he had never abandoned the dogmatic school of Hippocrates, and that he condemned the Paracelsists but had imitated such good old authors as Raymond Lull, Roger Bacon, Ripley, Rupescissa, and Christopher of Paris — all dating from the thirteenth to the fifteenth century.

A treatise on the elixir for white and for red (silver and gold) and on the great philosophic stone is represented in the edition of 1664 as having been composed in 1632. We read, 'By my hope of heaven I have declared to you what my eyes have seen, my hands have operated, my fingers have extracted. And I have written this booklet with my own hand, and signed it with my name, when I was in the last agony, the year 1632, May seventh.' Really the date should be 7 May, 1432, as manuscripts of the work at Cassel and Orléans show.

On the other hand, no manuscripts of *The Triumphal Chariot of Antimony* by Basil Valentine, which was so much cited in the course of the seventeenth century, are earlier than the middle of that century, while the work was first printed in German in the early years of the century, and did not appear in Latin translation until the decade of the 'forties. Basil Valentine was supposed to have been a monk in the fifteenth century and a precursor of Paracelsus, but his name first appears in 1599.

For many men in the seventeenth century Roger Bacon was a kindred spirit. Robert Fludd agreed with Gabriel Naudé that Roger had been wrongly accused of evil magic and had cherished only the good variety. Jacques Gaffarel cited Bacon in his *Unheard-of Curiosities* of 1629. Campanella during his long imprisonment made extravagant promises of the marvels which he would work, if released from captivity, which remind one of Roger's program for education and experimental science. He assured Cardinal Odoardo Farnese that, if set free, he would teach natural and moral philosophy, logic, rhetoric, poetic, politics, astrology, and medicine — all within a year's time and in admirable fashion, accomplishing more than ten years of ordinary study in the schools would. He would reform astronomy and the calendar. He would prove against Aristotle, Ptolemy and Copernicus — in favor of the Evangel — that the end of the world would be by fire. Under pain of losing all credit as a scholar, if he failed, he would fabricate a marvelous city and ships that move without oars or sails. He would open the whole world like a book from his mouth in two months, and, 'when you hear me, your books will seem to you mere tricks of jugglers.' If he but open his mouth at Rome, 'you will see a new heaven and a new earth, and from north and south a great rush to the Catholic Faith.' Gassendi might sneer at Bacon for representing Artephius as living for a thousand years by using a universal medicine or elixir of life, but failing to reach one hundred years himself. Marcus Marci cited him on the rainbow through Combach's edition of his section on Optics in *Specula mathematica* (Frankfurt, 1614), as well as Kepler's commentary on Bacon's contemporary, Witelo. Borrichius in 1649 and Webster in 1671 made use of the 'Epistle on the Secret Works of Art and Nature and Nullity of Magic.' And when Robert Boyle writes: 'I shall not scruple to confess to you that I disdain not to take notice

even of ludicrous experiments, and think that the "plays of boys" may sometimes deserve to be the study of philosophers,' he reminds us of Roger's ideal experimentalist who 'blushed if some layman or old-wife or soldier or rustic knew what he ignored' and who 'examined even the experiments of old-wives and considered their divinations and incantations and those of all the magicians, and likewise the tricks and illusions of all the jugglers, in order that nothing which he ought to know might escape him.' Sebastian Wirdig, in his *New Medicine* (Hamburg, 1673), quoted the 'Secret Works of Art and Nature' for a full page, and later quoted Bacon on talismans for nearly a page.

Albertus Magnus, too, was not forgotten in the seventeenth century. In the catalogue of the Museo Calceolario at Verona, which contained specimens from all three kingdoms: animal, vegetable and mineral, he was frequently cited along with Pliny and Dioscorides. Valerio Martini used him in his treatise on colors. Works of doubtful authenticity and magical content ascribed to him, such as the *Secreta* and *De mirabilibus mundi*, were perhaps those which were read most. Mersenne and Boyle questioned the genuineness of such works, but were probably unaware that in some cases similar statements may be found in Albert's writings of undisputed authenticity. Thus astrological images, for which I have found him cited by four authors in the seventeenth century, are supported in his *De mineralibus*. At any rate, we find him cited by Sennert and Castiglione for an amulet; Martius in 1700 recalls his speaking head. But J. J. Becher, writing to the Royal Society in 1680, had dismissed as a fable the story that Albertus Magnus had constructed a walking automaton which saluted and spoke to Thomas Aquinas, when it met him. When Aquinas smashed it, Albertus complained that he had destroyed the labor of twenty years. Guibélet in 1603 cites Albertus for a woman bearing twenty-two children at one birth; Besard in 1617, on ways to win love; Combach in 1620, for arguing that the stars might generate a human being from a cow. Alexander de Vicentinis in 1634 denied the contention of astrologers that dreams were caused by the stars, and the opinion of Albertus Magnus — and Dante — that a continuous effluvium from a celestial form affected the imagination of the dreamer. Alvaro Alonso Barba still cited Albertus in his book on metallurgy of 1640. But Marten Schoock, in his *Celestial Physics* published at Amsterdam in 1663, refused to listen to Albertus Magnus and others who attributed outbreaks of the plague to planetary conjunctions. From *De mirabilibus mundi* were repeated such prescriptions as rubbing one's eyes with the blood of a bat in order to be able to see in the dark.

Indeed, in general we find the books of secrets and of so-called experiments of thirteenth-century manuscripts closely paralleled, in seventeenth-century publications. Much was said of secrets and arcana of nature, and in favor of a mystic and cryptic style of writing, particularly in alchemy. Medical cases and prescriptions were still spoken of as experiments. A single secret prescription, powder, or pill might make a physician rich, and the secret was as carefully guarded as the prize trick of a magician. George Wilson whose *Complete Course of Chymistry* was first published in 1691, tells us that 'Mr. Lockyer got a good estate' by the composition of his pill. He adds the composition of a pill which he had from 'Dr. Starkey's own mouth, in the year 1665, a little before his death; who then told me,

he gave Matthews the former (pill) for a little money; but this is that which he successfully made use of himself.' A few pages later Wilson remarks concerning Starkey's and Matthews' pill, 'Those gentlemen who have not the conveniency to prepare it may for twenty shillings the pound have it of me.' Sometimes such remedies bore fancy names, as 'Mitigated Dragon' or 'Magnanimous Conception.' Abbé Bourdelot wrote in 1675 that, since he began to practice medicine, he had known forty or fifty physicians, each of whom had his particular secret. He called them kings for a few days, and deemed it more advisable to beware of a man with a single secret than of a man of one book.

Walter Harris, royal physician, issued his *Anti-Empirical Pharmacology* in 1683. Although in times past the world had been involved in dark and dismal ignorance, he believed that it was now so enlightened that all occult arts had vanished, 'and nothing but superstition, a deluge of gross superstition, can revive them again. For, although the world is as naturally inclined to superstition as to any one vice that can be named, yet it is never like to overwhelm Europe as it has done.' Chemical remedies, however, were so the rage, having the charm of novelty and mystery, that the preparations of nature or of old medicine were undervalued. All that potable gold amounted to was a mere solution of gold by corrosive spirits; Harris would rather just boil it. He was opposed to transmutation and projection, even if possible. Six great remedies which he thought were too much magnified were mercury, antimony, vitriol, steel, Jesuits' powder (i.e., quinine), and opium. Dr Willis's preparation of steel, nevertheless, was not only 'hitherto a great secret and sold at a great price,' but also the 'masterpiece of that eminent and ever famous man.'

Also, Harris still favored the use of compound medicines. 'As diseases are complicated, the medicines must be so likewise.' Theriac Andromache or Venice Treacle, which had sixty odd ingredients, 'will claim a preference before most others.' But both it and Mithridate were now very little used in France.

As for characters, charms and seals, their efficacy depended on deluding the patient's imagination. 'if the disease be merely imaginary and false, the true cure must be likewise false and imaginary.' Sometimes such cures acquire a widespread reputation. But as 'reasoners and doubters try' one, and it fails to work for them, other men gradually lose faith in it.

In a closing chapter, 'Of Mountebanks and other sorts of Empirics,' Harris complained that in other countries they 'are despised as the very dirt,' but continue to flourish in England.

The validity of astrology and the reality of witchcraft were repeatedly debated through the course of the seventeenth century. Morin, whose *Astrologia Gallica* was an elaborate attempt to rehabilitate that art, had been present at the birth of the infant Louis XIV in order to time exactly the horoscope of the future *Grand Monarque*, and owed his appointment to a royal professorship in mathematics at the University of Paris to the astrological service which he had rendered Catherine de' Medici. Astrological images, however, he rejected as inefficacious, although may lords and ladies offered to pay him handsomely for them.

In 1625 appeared the book of Gabriel Naudé on great personages in the past who had been falsely accused of magic. A century and a half later Abbé Claude-

Marie Guyon, in the eighth volume of his *Bibliothèque ecclésiastique* (Paris, 1771) was much impressed by Naudé's thesis, agreed with him that judicial astrology was the foundation of other occult arts, and distinguished natural from superstitious and diabolical magic. Yet, despite the warning by Naudé to writers on witchcraft to be more sceptical, the Abbé Guyon recounts in proof of diabolical magic an utterly absurd and incredible tale of shepherds accused of bewitching animals at Pacy. They appealed to the Parlement of Paris in 1688, and the last execution for sorcery by the Parlement of Paris was also at Pacy in 1691.

Some think that Pierre Duhem went too far in support of his contention that the dynamics of seventeenth century physics was launched back in the fourteenth century. At least his was a wholesome reaction which has turned scholars to investigation of the neglected physical science of the earlier century. I may note another example of that neglect. There were many writers on the rainbow in the seventeenth century, but few, if any, of them were aware that Dietrich of Frieberg and a writer in Arabic contemporary with him had offered essentially correct explanations of it in the first years of the fourteenth century. More than this, the learned editors of the splendid modern edition of the works of Huygens, who have done so much to correct other misapprehensions in the history of science, were in the year 1932 in their seventeenth volume equally in ignorance of Dietrich's treatise, although in the interim it had been printed in part in 1814, in whole in 1914, and discussed repeatedly.

Magic was still intermingled with science in the seventeenth century. There is general agreement that the *Principia* of Sir Isaac Newton was the outstanding and most epoch-making book of the century. In his other scientific published works, too, Newton was careful not to include anything that was not firmly supported by experimental proofs and geometrical demonstration, of which he did not feel certain, and which he felt should promptly convince everyone else, although it did not always succeed immediately in doing so. But he left more than a million words in manuscript which, we are assured, are 'of no substantial value.' Yet they 'were nearly all composed during the same twenty-five years of his mathematical studies,' and 'are just as sane as the *Principia*, if their whole matter and purpose were not magical.' 'The scope and character of these papers have been hushed up,' continues Lord Keynes, whose brilliant contribution to the *Newton Tercentenary Celebrations* of 1947 I have been quoting, 'or at least minimized, by nearly all those who have inspected them.' Speaking especially of the alchemical section, Lord Keynes said: 'I have glanced through a great quantity of this — at least 100,000 words, I should say. It is utterly impossible to deny that it is wholly magical and wholly devoid of scientific value; and also impossible not to admit that Newton devoted years of work to it.' And so Lord Keynes has not so much taken the words out of my mouth — for I would not have ventured to utter them, as he has brought grist to my mill, the *History of Magic and Experimental Science*, by representing the supreme figure of seventeenth century science as 'The Last of the Magicians,' and 'the last wonder-child to whom the Magi could do sincere and appropriate homage.'



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# The True Place of Astrology in the History of Science

By Lynn Thorndike \*

THE true place of astrology in the history of science is a vast subject with countless ramifications which it would take a long time to pursue and many pages to relate. My present purpose is to emphasize a single point, but one which is the most important and fundamental of all. Briefly stated, it is that, during the long period of scientific development before Sir Isaac Newton promulgated the universal law of gravitation, there had been generally recognized and accepted another and different universal natural law, which his supplanted. And that universal natural law was astrological.

One may, of course, employ the words "astrology" and "astrological" in a variety of senses and meanings, and they have often been so employed in times past. One may restrict the terms to the art of, or attempt at, prediction of the entire life of any and every human individual from the hour of his nativity, and dismiss this as an idle superstition. But nativities were only a single branch or department of astrology in the broad sense, and their validity depended upon the underlying assumption that the entire world of nature was governed and directed by the movement of the heavens and the celestial bodies, and that man, as an animal naturally generated and living in the world of nature, was also naturally under their rule. Astrological medicine was an obvious sequel of this assumption and was free from the objection that prediction of man's fate violated freedom of the will.

Huillard-Bréholles interpreted the word, "astrology," in a narrow sense, when he wrote of the emperor, Frederic II, "He believed in astrology to the last hour of his life," although he accounted for that emperor's penchant for astrology by his insatiable thirst for knowledge.<sup>1</sup> But he went on to say that Frederick's astrological speculations were only a branch of mathematics, which larger subject he cultivated "with a sort of passion," and loved to relieve the cares of government by study of the exact sciences.

Aristotle and the astrologers<sup>2</sup> were agreed that the heavens and celestial bodies were incorruptible and unchanging, that their motion was regular and

\* Columbia University.

<sup>1</sup> *Historia diplomatica Friderici Secundi*, VII (1859), dxxxi-dxxxiii.

<sup>2</sup> The friction between the faculties of arts and of theology at Paris, of which Professor Mary Martin McLaughlin treated in a paper on "Medieval University Masters and Ideas of Intellectual Freedom," at the sixty-ninth annual meeting of the American Historical Association on 28 December 1954, was not merely a matter of difference between a rational and a dogmatic

mode of approach, or of how the works of Aristotle should be taught, but a more fundamental divergence between the supernatural and this universal natural law which was astrological. Of the 219 opinions which were condemned at Paris in 1277, a large number was astrological in one or another sense of that word. This would have proved to be even more true in the case of universities like Padua and Bologna, where the arts course was pre-medical rather than leading on to the study of theology, as it did at Paris.

eternal, circular and perfect, that they were a superior fifth essence distinct from the inferior elemental world of our earth and its atmosphere, where generation and corruption and alteration prevailed, changing seasons of the year and daily weather permutations, geological formation and dissolution, changing sea-coasts and river-beds, earthquakes, volcanoes and floods, growth and decay of vegetation, birth and death of animals.

Moreover, all these processes corresponded to the movements and positions of the heavenly bodies. The stars were not themselves affected by their movement and light, since they were eternal and incorruptible. But their motion and rays had to have some effect, and an outlet for this vast store of energy was found in our elemental world, whose changes and fluctuations and variations paralleled the shifting pattern of the eternal heavens and the varying projection of rays of light and influence thence. Furthermore, the earth was thought of as the center and bottom of the universe, and it was fitting that inferiors should be ruled and governed by superiors — the heavenly bodies. As the concluding sentence of a philosophical manual in a manuscript of the fifteenth century<sup>3</sup> put it, "Certain therefore is the influence of the heavens on these inferior bodies." The heavenly bodies were responsible for all meteorological phenomena in the region or regions of air; they caused the tides in the sphere of water; they affected all generation upon earth, and sometimes produced spontaneous generation without sexual intercourse; they formed gems and strata of rocks underground, so that it was the most logical thing in the world to relate seven metals to the seven planets, as was done for centuries.

A special appeal might be made to celestial influence in order to explain the operation of occult virtue, such as that of the magnet. But this should not blind us to the fact that celestial influence was the general and universal cause of all inferior nature. "Coelum per formam suam agit," quoth Duns Scotus.

The most scientific form of weather prediction was astrological, and an abundant literature on the subject, derived from India as well as from the Arabic, instructed one how to forecast rain, winds, and changes of temperature from the movements of the planets — direct, retrograde or stationary — through the twelve signs of the zodiac and the twenty-eight mansions of the moon.

In other cases, it might be possible to arrive at roughly correct and satisfactory conclusions from the observation of terrestrial phenomena as immediate causes, but in such cases too the heavens were the remote and primary cause. This had been the law of nature and the fate of the ancient Stoics. This general rule of the heavens over the world of nature was held by Albertus Magnus and Thomas Aquinas, by Tycho Brahe and Kepler.

More than thirty years ago I wrote with regard to Albertus Magnus:

This general law that the world of nature and of life on this earth is governed by the movements of the stars is expressly repeated again and again in Albert's works, and its truth is assumed even oftener.<sup>4</sup>

I may add now two further specific illustrations from his works of the applica-

<sup>3</sup> Vatican Barberini Latin MS 343, fols. 66-80.

<sup>4</sup> *A History of Magic and Experimental Science*, II (1923), 583.



tion of this law. The figure of a plant imitates the pyramid of celestial light,<sup>5</sup> and, although living bodies are more highly organized than inanimate things, they also deviate less from the norm and are more closely related to celestial nature than are other material bodies. By their equality of complexion they participate by analogy in the principle of celestial life. That celestial principle has more power over the matter of the body than the body's own corporal form has. Hence the influence of the stars has more effect upon animate creatures than their corporal nature has, and moves them to forms which are not of the elements, nor are their compounds consequences of the elements, but the celestial force works in them not one but many impressions, none of which their corporal nature could effect.<sup>6</sup> Even in his *Summa theologica*, in discussing the sixth day of creation and the divine command, "Let the earth bring forth the living creature," Albert asked how that could be, "since the power to produce animals is not in the earth, but, according to astronomers, is in the heavens." Ultimately Albert reached the conclusion that, when God said, "*Producat terra*," He designated the earth merely as the material principle from which animals are formed, but that the active principle is the heavens.<sup>7</sup>

This rule of the heavens should be kept constantly in mind by every student of the history of science before Newton in evaluating any aspect of scientific or, for that matter, human activity. Most past critics of what they were pleased to call astrology never questioned this assumption, which was its very basis. They began to do so in the sixteenth and seventeenth centuries, as the distinction between earth and heavens was gradually obliterated, and this led on to Newton's new development. But to hold that natural or physical law was a concept then first inaugurated is to do astrology, in the sense that I have been using the term, and also the previous period, a grave injustice.

As an example of this common misconception may be quoted a passage from Bidney's book on Spinoza in the year 1940:

The characteristic features of Renaissance philosophical thought were the revival of the atomic theory in conjunction with mathematics, and the consequent stress upon the primary importance of the efficient cause as a principle of definition and explanation. Beginning with the experiments of Galileo and his success in measuring the rate of acceleration of falling bodies, the conviction gradually arose that nature as a whole was subject to immutable laws which could be mathematically expressed—a process which Newton brought to a brilliant culmination. In other words, there were universal laws of becoming, laws of change which governed the correlation between particular events. This was an entirely new and seminal idea which was destined to revolutionize the natural sciences.<sup>8</sup>

But surely astrology had for centuries before believed in universal laws which governed particular events, and that nature as a whole was subject to immutable laws.

<sup>5</sup> *De veget. et plantis*, II, i, 5.

<sup>6</sup> *Ibid.*, I, i, 1.

<sup>7</sup> *Op. cit.*, II, xi, 61.

<sup>8</sup> David Bidney, *The Psychology and Ethics of Spinoza*, 1940, pp. 13-14. Edgar Zilsel, "The

Genesis of the Concept of Physical Law," *Philosophical Review*, 61 (1942), 245-79, dismissed astrology in two or three sentences such as (p. 252) "In the astrological literature of late antiquity sometimes laws of nature are mentioned in an entirely magical sense."

Modern historians of science have been strangely blind to the fundamental and universal importance of this sweeping, all-inclusive hypothesis, that all operations of the inferior world of nature spring from and are controlled by the eternal movement of the incorruptible celestial bodies. Strangely blind also to its supreme significance in the appreciation and comprehension and evaluation of pre-Newtonian scientific thought and activity! A few, however, have come close to the realization of this. George Sarton, in one passage in his monumental *Introduction to the History of Science*, comes close to recognizing it, when he writes of Roger Bacon:

He was deeply interested in astrology, in which he believed implicitly. . . . Astrology itself he divided into two kinds; a legitimate kind, and a forbidden one, mere superstition. This was very sound, in spite of the fact that much if not all of Bacon's legitimate astrology was nothing but error and superstition from our point of view.<sup>9</sup>

In another passage Sarton says:

However, Bacon's thoughts did not dwell so much on statics as on dynamics. He was pondering on the nature of force, especially on force or action at a distance. Curiously enough, these thoughts, earnest as they were, were partly astrological. For among the forces or actions considered by him were light and gravity, but also astrological influences, the reality of which were beyond doubt. How were these astrological influences transmitted across the open spaces? How were these distant causalities propagated? It was very remarkable to ask such questions. and we must not blame him for failing to solve them.<sup>10</sup>

On this second passage our comment must be that there was nothing curious about Bacon's thought; it was quite logical and natural. Nor was it very remarkable to ask such questions. Rays of light and of astrological influence were propagated from the same heavenly bodies in accordance with the natural law of the universe, the causation of inferiors by superiors.

Mark Graubard has recently written of astrology not as a past superstition but as a fossil science.<sup>11</sup> Yet he does not seem to realize that it depended upon a once generally accepted hypothesis of universal natural law.

Such a law is tacitly or virtually admitted in many a passage in A. C. Crombie's *From Augustine to Galileo: the history of science, A.D. 400-1650*. At page 9 he speaks of "astrological interpretation of the world of nature as a whole"; at pages 35-36, he says, "'Celestial virtue' was admitted as a cause by nearly all the Latin writers of the 13th century"; at page 40 we read, "From the four elements were produced, under the influence of the celestial spheres, plants, animals and man himself"; at page 95 he states that Ristoro d'Arezzo "was very astrological. He attributed the elevation of dry land above the sea to attraction by the stars"; at page 122 we learn that Arabic writers and Latin schoolmen "generally supposed that such forces" (of generation) "were supplied by celestial virtue." But the basic generalization towards which these scattered passages point is not brought out, and sometimes astrology is spoken of as a superstition which the more enlightened made fun of.<sup>12</sup>

<sup>9</sup> *Op. cit.*, II, 956.

<sup>10</sup> *Ibid.*, II, 763-64.

<sup>11</sup> *Astrology and Alchemy, Two Fossil Sciences*, New York, 1953.

<sup>12</sup> *Op. cit.*, pp. 8-9.

Bally-hooers for the uniqueness of modern science have further repeatedly insisted that mathematical method was then first applied to the investigation of natural phenomena. Francis Bacon, with his inductive method, has been sharply criticized for his neglect of mathematical method. I hold no brief for poor old Francis. But give me leave to say that astrology certainly applied mathematical method to natural phenomena. Geometry and trigonometry, sines and chords, were needed to trace the courses and to find the positions of the planets. The *Almagest* of Ptolemy was primarily mathematical in its method, nor were its mathematics of an easy sort. In astrology, furthermore, timing was of utmost importance. Tables were carried not merely to minutes and seconds, but thirds and even farther. The projection of rays and problems of reflection and refraction were as much the concern of astronomy and astrology as they were the concern of perspective and optics. Regiomontanus has been called the first modern mathematician. But he was not the first to draw up tables of astrological directions. All the observations and measurements of the stars, all the devising of astronomical instruments, all the calculation of astronomical Tables, were motivated by the urge to implement the universal law of nature in the service of humanity.

In previous periods astrology and astronomy had regarded themselves as far superior to physics and mechanics. Newton's *Principia* destroyed the age-long distinction between superiors and inferiors. The astrological wings of high-flying science melted; it fell back to earth and became terrestrial. But this change came about slowly. The Jesuit, Menestrier, writing in 1694 seven years after the publication of Newton's *Principia*, while attacking engraved astrological images and the belief in the stars as particular causes, yet had no doubt that they were general causes of all inferior nature. Moreover, the new Newtonian physics did not affect biology and medicine, which had to wait for the doctrine of evolution, whereas the astrological hypothesis had been a universal law for them too.

Herbert Dingle, in a paper read last year at the Seventh International Congress of the History of Science at Jerusalem, upon "The Essential Elements in the Scientific Revolution of the Seventeenth Century," held that the object of all science is

. . . the detection of regularities in our experience and the expression of those regularities in the simplest and most comprehensive rational form.

Such regularity had been the aim, the ideal, the boast and the assumption of astrology. Dingle further argued that

It is reasonable to look forward to the time when all the sciences will be fused into a single science, using a single set of concepts, though that time may yet be distant.

If we may look forward to such a unified science, we may also look backward to it, before the seventeenth century, to the time when all change and all

phenomena in the elementary world were believed to be governed by the radiations of the eternal and incorruptible, yet moving, celestial spheres.<sup>13</sup>

<sup>13</sup> It should hardly be necessary for me to state that I do not share this belief or have any faith in the methods of astrology. I further recognize that the rule of all terrestrial nature by the movements and influence of the heavenly bodies was not a law in the modern sense of being mathematically demonstrable. My pur-

pose has been merely to emphasize that this belief was generally held by scientists and by mankind at large for centuries, and should be taken into account by every historian of that period.

This paper was first presented at the annual meeting of the History of Science Society, on 30 December 1954.

## ❧ NOTES & CORRESPONDENCE ❧

### *The Critical Bibliography*

The last issue of *Isis* contains the Eightieth Critical Bibliography. The Eighty-first is in the process of preparation, and will be published at the end of the year. All readers of *Isis* are urgently requested to send reprints or tear-sheets of articles and book reviews dealing with the history of science and its cultural influences to the editor, I. Bernard Cohen, Widener Library 189, Cambridge 38, Mass., so that they may be included. When relevant articles appear in *Festschriften* or other works from which reprints are not available, it would be helpful if full bibliographical citations might be sent.

I. B. C.

\* \* \*

### *Current Work in the History of Medicine*

The Wellcome Historical Medical Library has undertaken the listing of current periodical literature dealing with the history of medicine. A permanent cumulative subject index to all historical papers dealing with or relating to medicine is being established at the Wellcome Library. It has seemed to the editors a useful extension of this service to medical historians to plan the issuing from time to time of an index to papers which have already appeared. Three lists have thus far appeared, each covering a quarterly period, the most recent one, July-September, 1954. In the first list, articles have been listed under two sets of classification, the first according to subject (e.g., alchemy, anaesthesia, anatomy, 15th century, 16th century . . . biochemistry, blood, cancer, critical days . . .), and the second, according to person

(each article being listed under the name of the individual to whom it is devoted). The most recent number contains one master subject index, in which medical topics and medical men are combined. An unusual feature is a list of authors and addresses for each citation, and a list of the periodicals indexed. The third number also contains a complete author index to the first three numbers.

One especially useful feature of this valuable publication is the adoption of the *World List of Scientific Periodicals'* system of abbreviation. It would be most helpful if all bibliographical citations in the history of science and of medicine could make this a universal system.

In hailing this new publication, we wish it a long and useful life, and congratulate the editor, F. N. L. Poynter, upon it. Mr. Poynter says that "interested persons may write to be put on our mailing list, and of course we should be very glad to receive any reprints on the history of medicine and also to have any information about forthcoming books."

Mr. Poynter's splendid *Catalogue of the Incunabula in the Wellcome Library* is reviewed in the Eightieth Critical Bibliography in the previous issue of *Isis*. Mr. Poynter informs me "that the first volume of the General Catalogue, which includes books printed before 1640, is now in press and should be out next year. It contains about 10,000 items."

I. B. C.

\* \* \*

### *Annual Meeting, Section L, A.A.A.S.*

From 28 through 30 December 1955, Section L, History and Philosophy of Science,



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# Eclipses in the Fourteenth and Fifteenth Centuries

By Lynn Thorndike \*

IN previous articles attention has been called to the prediction of eight solar eclipses between the years 1366 and 1386,<sup>1</sup> in a manuscript at Utrecht, and to "A Record of Eclipses for the Years 1478 to 1506,"<sup>2</sup> in a manuscript at Florence. In the present paper will be noted further forecasting of eclipses, primarily from five Sloane manuscripts of the fourteenth and fifteenth centuries at the British Museum, and chiefly in connection with calendars issued by Englishmen: namely, that of Walter de Elvedene or Elvedene<sup>3</sup> or Elvenden<sup>4</sup> for the years from 1327 to 1386, and those for the ensuing period, 1387–1462, composed by John Somer or Somur or Somour in 1380, for Joan of Kent, princess of Wales and mother of Richard II, and by Nicholas of Lynn in 1386, at the request of John of Gaunt, duke of Lancaster. But how their data as to eclipses were computed is not revealed in our manuscripts.<sup>4a</sup> The Calendar of Nicholas was for the latitude and longitude of Oxford, and John Somer is sometimes spoken of as "of Oxford," and his calendar as for its meridian. Both men are mentioned in the preface to Chaucer's Treatise on the astrolabe.<sup>4b</sup>

Since their two calendars and the tables which accompany them apply to the same years, it has been easy to confuse them, especially when they appear anonymously.<sup>5</sup> Their prefaces may be distinguished by their incipits, "Quia Christus Jesus mediator dei . . ." in the case of Nicholas, and "Ad honorem dei et virginis gloriose necnon sanctorum confessorum Francisci Antonii episcopi Lodowici in hoc opusculo facio kalendarium ad instantiam nobilissime domine Iohanne principisse Wallie ducisse Cornubie comitisse Castrie . . ."<sup>6</sup>

\* Columbia University.

<sup>1</sup> "Prediction of Eclipses in the Fourteenth Century," *Isis* 1951, 42: 301–302.

<sup>2</sup> *Isis*, 1952, 43: 252–256.

<sup>3</sup> MS Digby 176 at the Bodleian Library, Oxford, once contained, according to its old table of contents, written in a hand of the fourteenth century: "Calculatio M. Walteri Elvedene de dominis mensium ab anno 1332 usque ad 1357, annorum ab anno 1332 usque ad 1386."

<sup>4</sup> W. H. Black's Catalogue of the Ashmolean MSS at the Bodleian, p. 4, in connection with MS Ashmole 5, refers to "the tables formerly composed by master Walter de Elvenden for the three cycles or 57 years which ended in 1386" Walter is not included in the *Dictionary of National Biography* or in Sarton's *Introduction to the History of Science*.

<sup>4a</sup> Instructions for computing eclipses are of not infrequent occurrence in MSS of the later middle ages. Two examples are: Basel F. II. 15,

15th century, fols. 73r–95v: "Ad inveniendum eclipses sic procedendum est. Primo sumantur radices motuum solis et lune. . . . Et sic finitur practica de utraque eclipsi scilicet tam solis quam lune, facta anno Ihesu Christi 1437 incompleto mense Iulii die 20. Deo gratias. Amen." Basel F. III. 25, 13–14th century, fol. 9r, "De solis vera coniunctione reperienda . . ."; fol. 13va. "Cum eclypim lune et eius quantitatem prompte et evidenter invenire volueris . . ."

<sup>4b</sup> Sarton, *op. cit.*, III (1948), 1501–2. *The Equatorie of the Planetis*, edited by Derek J. Price, Cambridge University Press, 1955, pp. 79, 86, 157.

<sup>5</sup> Black, in the description of Ashmole 5, mentioned in a preceding note, listed some other MSS at the Bodleian as the Calendar of Nicholas which are rather that of John.

<sup>6</sup> British Museum, Cottonian MS Vespasian E. VII, fol. 4(7)r. Such a form as "Ad honorem dei et virginis gloriose necnon et omnium (sanc-

in the case of John Somer, who was a Franciscan. But whether the right calendar always accompanies its preface is another problem. In Sloane 282 of the British Museum what seems the calendar of John Somer opens at fol. 5r, but the aforesaid preface comes only at fol. 17r-v.<sup>7</sup> Sometimes there is no preface,<sup>8</sup> and it is not easy to determine an incipit for the Calendar itself.<sup>9</sup>

Furthermore the Tables and figures and other matter accompanying the Calendars vary in different manuscripts. John Somer says in his preface that his Calendar contains Tables of conjunctions from 1387 to 1462.<sup>10</sup> But these are found in only three out of 13 copies of his work at the British Museum.<sup>11</sup> If we compare Royal 2. B. VII and Sloane 282, which both contain the Calendar of Somer, we find that the former manuscript has an Algorism Table (found also in Cotton, Vesp. E. VII) which is not in the latter, apparently also a *Tabula paschalis* and one of Golden numbers. "Cave"s for each sign of the zodiac which precede the calendar in Sloane 282,<sup>12</sup> are perhaps roughly paralleled by influences of the signs of the zodiac (with blank space for a sign-man, for which no provision is made in the other manuscript) which are the fourth item following the Calendar in the Royal MS. The Tables of ruling planets and signs and of the positions of the moon in Royal 2. B. VIII, fols. 9v-10v, correspond to Sloane 282, fol. 13r, "Tabula docens quis planeta regnat in qualibet hora incipiendo diem ab ortu solis";<sup>13</sup> 13v, "Tabula lune ad sciendum eius signum omni die";<sup>14</sup> 14r, "Tabula lune ad sciendum eius gradum omni die."<sup>15</sup> And there are Tables and figures of solar and lunar eclipses in both.<sup>16</sup>

It is with these tables of eclipses rather than the Calendars proper that we

torum) . . .", given by Black for Ashmole 391. V, 14th century, fol. 1r, is inaccurate. I did not get to examine the Cotton MS further for Tables of eclipses.

<sup>7</sup> Black, in cataloguing Ashmole 789. VIII, remarked that the preface differed considerably from the prefaces to the calendar in Ashmole 5 and 391. V, which was not surprising in the case of Ashmole 5, which has the incipit of Nicholas of Lynn, whereas the other two MSS have that of John Somer.

<sup>8</sup> Ashmole 370, anno 1424, fols. 1-24, "has neither title nor preface, but in other respects agrees with No. 5; each month occupies 4 pages in this and 5 in that MS." Sometimes, as in Ashmole 391. V, we have a preface, but the Calendar has disappeared.

<sup>9</sup> "Ad notitiam tabularum et kalendarii . . ." seems to be the usual opening of John Somer's Canon for his Calendar: see Sloane 2250, late 14th century, fol. 1r; Sloane 2465, late 14th century, fol. 1r; Royal 12. E. XVI, 15th century, fol. 9v; Oxford, Bodleian, Rawlinson D. 238, end of 14th century, fol. 15.

But in Sloane 282, 15th century, fol. 5r-v, the preliminary description opens, "In hoc calendario ad meridiem universitatis Oxonie composito anno domini 1380 primo ponuntur menses . . ." And in Ashmole 391. V, 14th century, fol. 1r, "In hoc kalendario primo

ponitur numerus dierum in prima linea . . ."

<sup>10</sup> The description in the Catalogue of Royal 2. B. VIII does not state whether they are planetary conjunctions (as of Saturn and Jupiter) or conjunctions (and oppositions) of sun and moon.

<sup>11</sup> "Of thirteen copies of Somer's work in the Museum only three (Cotton MS Faust. A. II, Add. MS 10628, Harley MS 321) contain the computations for the years above mentioned"; from the Catalogue's account of Royal 2. B. VIII.

<sup>12</sup> In Sloane 2465, 14th century membrane, they follow the Kalendarium (at fols. 2-7) at fol. 10r as "Signa zodiaci."

<sup>13</sup> In Sloane 2465 at fol. 9r. Similarly the Calendar of Nicholas of Lynn in Ashmole 5 is accompanied at fol. 35r by "Tabula ad sciendum quis planeta dominatur pro omni hora diei et noctis incipiendo ab ortu solis."

<sup>14</sup> Ashmole 5, fol. 34r, "Tabula ad sciendum in quo signo fuerit luna quolibet die quantum ad medium motum."

<sup>15</sup> Sloane 2465, fol. 9v.

<sup>16</sup> Also in Ashmole 5, fols. 29r-33r. It also has a figure of the human body related to the signs of the zodiac, a "Nota quem humorem quisque planeta eicit," a "Tabula ad inveniendum dignitates planetarum in signis," and "Equationes domorum ad latitudinem 41° 40'."

are here concerned. In the case of those by John Somer, as time went on, the period which they covered altered. Thus in Sloane 282 they begin not from 1387 but from 1409; in Sloane 2250, from 1400; in Sloane 2465, from 1399 and 1406. In Sloane 2397 only the fourth cycle from 1444 to 1462 is covered. These four manuscripts are all of the Calendar of John Somer. Only with Sloane 1110 do we come to that of Nicholas of Lynn. But first we turn back to that of Walter of Elvedene before 1386 in the fourteenth century.

In MS Sloane 286 (membr. in-4) at the British Museum the *Computus* of Sacrobosco in a hand of the thirteenth century at fols. 1-14 is followed at fols. 15-24 by a calendar of Master Walter of Elvedene with tables of solar and lunar eclipses from 1327 to 1386 in writing of the fourteenth century.<sup>17</sup> The table of solar eclipses (at fol. 21v) begins with the first cycle from 1330 to 1348, for which it lists eight; the same number for the second cycle from 1349 to 1367; and seven during the third cycle from 1368 to 1386. Of lunar eclipses Walter gives two for 1327 and 1328, 17 for the first cycle, 14 for the second, and 19 for the third.<sup>18</sup>

In Sloane 282 the calendar of John Somer for the meridian of Oxford, composed in 1380, is followed by tables of twenty solar eclipses from 1409 to 1462 and of forty-two lunar eclipses which occurred between 1410 and 1462. Seven eclipses of the sun are announced for the years 1409-1424, eight for 1425-1440, and five for 1448-1462. Of lunar eclipses twelve fall in the years 1410-1424, four in 1424-1429, eleven in 1431-1443, and fifteen between 1444 and 1462.

In Sloane 2465 the Calendar of John Somer appears anonymously without his preface.<sup>19</sup> Four eclipses of the sun are listed for the second cycle as follows:

June 15, 1406 at 16.43.24 P.M.  
 Oct. 18, 1408 at 19.59.45 P.M.  
 April 15, 1409 at 9.28.02 P.M.  
 Aug. 19, 1411 at 4.51.02 P.M.<sup>20</sup>

Schroeter<sup>21</sup> and Oppolzer date the first two of these eclipses on June 16 and

<sup>17</sup> At fol. 15r. is Walter's Canon on the calendar, opening and closing: "Quidam homines multum affectant scientiam astronomie scire et comprehendere . . . / . . . situationis vel situm (?) eclipsi solis. Explicit canon super kalendarium compositum a magistro Waltero de Elvedene." The Calendar itself occupies fols. 15v-21r.

<sup>18</sup> Fol. 22r: "Tabula eclipsis lune pro anno Christi 1327 et 1328 et pro primo ciclo cuius principium est annus Christi 1330, finis autem eius 1348." The tables for the second and third cycles are on fol. 22v. Figures for the 23 solar eclipses occupy fol. 23r; at fols. 23v-24v are figures for the 52 lunar eclipses.

<sup>19</sup> It opens at fol. 1r, "Ad notitiam tabularum et kalendarii sequentium primo ponitur tabula docens legere algorismum . . ." This corresponds to the incipit of the Algorism Table which follows his preface in MS Royal 2. B. VIII. There follows at fol. 1v: "Tabula docens pro 140 annis ab A.D. 1367 quis sit annus bisextilis, que littera dominicalis, que indictio, et que primatio inchoandi annum a Circumcisione Domini excepta indictione que incipit 8 Kal. Octobris."

<sup>20</sup> Sloane 2465, fol. 8.

<sup>21</sup> J. F. Schroeter, *Spezieller Kanon der zentralen Sonnen- und Mondfinsternisse*, Oslo, 1923.



October 19, to which the above dates are equivalent, since they reckon the day from noon rather than from midnight. Most of the dates for lunar eclipses between the years 1399 and 1424, presumably reckoned for the meridian of Oxford rather than Greenwich or London, are pretty accurate, often varying by only a few seconds from those given in the Canons of Schroeter and Oppolzer.<sup>22</sup>

| Sloane 2465,<br>fol. 10v | P.M.                   | Schroeter | Oppolzer        | Schroeter, Mitte<br>der Finsterniss |
|--------------------------|------------------------|-----------|-----------------|-------------------------------------|
| 1399 April 20            | 8 <sup>23</sup> .05.59 | 18.5      | 19.45           | 19.48                               |
| 1402 Feb. 17-18          | 16.06.37               |           | 5.07            |                                     |
| 1403 Aug. 2              | 8.33.46                | 20.47     | 22.33           | 22.37                               |
| 1405 Dec. 5-6            | 17.54.32               |           | 6.28            |                                     |
| 1406 June 1              | 10.36.22               |           | 0.38 (June 2)   |                                     |
| 1406 Nov. 25             | 8.00.04                | 19.44     | 21.27           | 21.31                               |
| 1407 May 21              | 11.30.27               |           | 1.12 (May 22)   |                                     |
| 1410 March 21            | 10.15.05               |           | 0.13 (March 22) |                                     |
| 1414 Jan. 5-6            | 18.33.27               | 6.27      | 8.11            | 8.13                                |
| 1414 July 2-3            | 14.33.10               | 3.02      | 4.51            | 4.64                                |
| 1414 Dec. 26             | 3.06.04                | 15.13     | 16.53           | 16.57                               |
| 1417 April 30            | 13.19.35               | 1.23      | 2.59            | 3.2                                 |
| -May 1                   |                        |           |                 |                                     |
| 1418 Oct. 14             | 8.15.28                | 20.24     | 22.05           | 22.7                                |
| 1421 Feb. 17             | 5.37.10                | 17.56     | 19.43           | 19.45                               |
| 1421 Aug. 12-13          | 16.22.02               | 4.30      | 6.16            | 6.20                                |
| 1422 Feb. 6              | 6.26.04                |           | 19.54           |                                     |
| 1422 Aug. 2              | 9.39.13                |           | 23.10           |                                     |
| 1424 Dec. 5-6            | 16.28.18               | 4.37      | 6.20            | 6.24                                |

In Sloane 2397 of the fifteenth century, Tables of solar and lunar eclipses for the fourth cycle accompany the Calendar of John Somer. Five solar eclipses of 1448, 1450, 1453, 1460 and 1462 are the same as in Sloane 282.<sup>24</sup> The table for lunar eclipses is as follows, beginning, like the solar, with the Golden Number and Dominical Letter:

<sup>22</sup> Th. Ritter v. Oppolzer, *Canon der Finsternisse*, Vienna, 1887, in *Denkschriften der kaiserlichen Akademie der Wissenschaften, Mathematisch-Naturwissenschaftliche Classe*, Bd. 52. Oppolzer gives only "die Weltzeit der grössten Phase der Finsterniss in Stunden und Minuten." Our MS like Schroeter gives the time of

the beginning of partial eclipse. But Schroeter includes only total lunar eclipses. Our MS gives the time in hours, minutes and thirds.

<sup>23</sup> Apparently the figure for six has been miscopied as an eight.

<sup>24</sup> See the Appendix for these.

| Sloane 2397,<br>fol. 14r      |  | Initium  | Schroeter | Puncta   | Tempus<br>casus | Duratio | Oppol-<br>zer |
|-------------------------------|--|----------|-----------|----------|-----------------|---------|---------------|
| 1 d 1444 May 31 d             |  | 5.56.16  |           | 4.41.29  | 1.10.35         | 2.21.18 | 2.24          |
| 3 b 1446 Oct. 4-5 d           |  | 11.32.28 | 23.22     | 11.52.34 | 1.41.34         | 3.23.08 | 3.18          |
| 4 a 1447 Mch. 31-<br>Apl. 1 f |  | 17.02.01 | 5.2       | 12.48.53 | 1.14.01         | 3.25.46 | 3.28          |
| 5 f 1448 Sept. 12 c           |  | 9.50.12  |           | 1.09.24  | 0.34.07         | 1.08.14 | 1.12          |
| 7 d 1450 Jan. 27-28 f         |  | 10.38.55 | 22.55     | 14.46.08 | 1.12.21         | 3.35.06 | 3.30          |
| 7 d 1450 July 24 b            |  | 4.35.30  | 17.7      | 18.21.09 | 1.04.46         | 3.47.07 | 3.40          |
| 8 c 1451 " 13-14 e            |  | 9.57.05  |           | 7.48.07  | 1.28.50         | 2.57.40 | 2.52          |
| 12 c 1455 May 1 b             |  | 10.48.53 |           | 2.45.52  | 0.55.23         | 1.50.47 | 1.54          |
| 13 c 1456 Mch. 21-22 c        |  | 16.28.42 |           | 0.23.46  | 0.21.41         | 0.43.23 | 0.36          |
| 14 b 1457 Sept. 3 a           |  | 8.22.59  | 20.24     | 14.28.41 | 1.13.11         | 3.33.33 | 3.32          |
| 17 e 1460 July 3 b            |  | 6.21.47  |           | 3.14.42  | 1.00.25         | 2.00.50 | 1.02          |
| 17 e 1460 Dec. 27-28 d        |  | 10.26.37 | 22.25     | 15.33.30 | 1.10.08         | 3.38.32 | 3.34          |
| 18 d 1461 June 22 e           |  | 6.46.08  | 18.50     | 20.16.42 | 3.03.47         | 3.48.12 | 3.42          |
| 18 d 1461 Dec. 17 a           |  | 1.38.10  | 13.11     | 12.55.29 | 1.21.36         | 1.26.20 | 1.30          |
| 19 c 1462 June 1-2 a          |  | 12.35.21 |           | 6.47.52  | 1.23.32         | 2.46.24 | 2.40          |

The Calendar of Nicholas of Lynn, as found in Sloane 1110, opens at fol. 2r, "Quia Christus Jesus mediator dei . . ." After the Calendar proper at fols. 3r-29r, comes at 29v a Table of solar eclipses for the four nineteen-year cycles 1387-1405, 1406-1424, 1425-1443, and 1444-1462, or, more specifically, from the eclipse of 1387 to that of 1396, from that of 1406 to that of 1424, from that of 1425 to that of 1440, and from that of 1448 to 1462. Illuminated figures of these eclipses fill vol. 30r. Tables of lunar eclipses for the same four cycles occupy fols. 30v-31r, and figures of them, fols. 31v-32r. Of other Tables at fols. 32v-37r, we may note one to find the dignities of the planets in the signs and the continuations of the motion of the sun from A.D. 1385 to A.D. 1469.<sup>25</sup> In the Appendix is reproduced the portion of the Table of Solar Eclipses from that of 1448 to 1462. The varying dates for these eclipses of John Somer are given in parentheses from Sloane 2465.

Attention may further be called to an isolated prediction of a single eclipse which occurs in another manuscript at the British Museum, number 3731 of the Harleian collection. In the course of an annual prediction for the year beginning on March 11, 1430 (the vernal equinox), a partial solar eclipse is forecast for February 12, 1431, at 2.19 P.M., "diebus equatis," with the second degree of Cancer rising "above our horizon." "Our horizon" is that of Milan, to whose duke the prediction is addressed by a Vernadigius or Bernadigius of that city. The duration of the eclipse will be about two hours.<sup>26</sup>

<sup>25</sup> Fol. 37v opens, "Pro declaratione punctorum in principio huius Kalendarii positorum . . ." On 40r, near the bottom of the page, is the rubric, "Canon pro minutionibus faciendis et purgationibus recipiendis," incipit, "Quia secundum sententiam Tholomei in suo Centilogio . . ." At 40v it breaks off and the present MS ends, but a modern note says, "The portion here wanting may be found in MS Arundel 347." Another MS where it is ascribed to Nicholas of

Lynn is at the Bodleian, Oxford, Ashmole 391, V, 14th century, fols. 4-5. It occurs anonymously in MSS at Cambridge and Munich: Cambridge University Library 1569 (Gg. V. 37), 15th century, fols. 160v-161; CLM 10661, anno 1470, fols. 71ra-72ra.

<sup>26</sup> Harley 3731, fol. 195va: "Durabit autem illa eclipsis a principio observationis usque ad totalem restaurationem luminis solis 2 horis equalibus fere."

Oppolzer and Schroeter indicate a solar eclipse for the same day (total for a central portion of Italy south of Milan) but at an earlier hour (about 1.20 P.M. for "der wahren ekliptischen Conjunction"). The Harley manuscript gives the hour and minutes for the vernal equinox on March 11 as 7.10 P.M., "diebus equatis," with the ascendent "for our horizon"  $13^{\circ}$  Libra "in hora lune." It further states that the opposition of sun and moon immediately preceding the vernal equinox will be on March 9 at 20.24 P.M. "diebus equatis" (i.e. 8.24 A.M. on March 10).<sup>27</sup>

## APPENDIX

TABLE OF SOLAR ECLIPSES: SLOANE 286, FOL. 23R.

| Cycle | Year | Month | Day | Latitude<br>of<br>Moon | Puncta<br>Minuta<br>Secunda | Tempus<br>casus | Semi-<br>diameter<br>solis | lune  | Duratio,<br>in hours,<br>minutes,<br>seconds |
|-------|------|-------|-----|------------------------|-----------------------------|-----------------|----------------------------|-------|--|
| 1     | 1330 | July  | 17  | 4'51 N                 | 10.15.18                    | 1.02.00         | 15.49                      | 16.04 | 2.04.00                                      |
| 4     | 1333 | May   | 15  | 6'43 S                 | 9.28.03                     | 1.06.43         | 15.48                      | 15.43 | 2.07.26                                      |
| 9     | 1338 | Feb.  | 20  | 26.41 N                | 1.1.03                      | 0.34.40         | 16.28                      | 14.51 | 1.09.20                                      |
| 10    | 1339 | July  | 7   | 0.04 S                 | 11.59.51                    | 1.07.08         | 15.47                      | 15.48 | 2.14.16                                      |
| 12    | 1341 | Dec.  | 9   | 16.16 N                | 6.17.28                     | 0.54.34         | 16.49                      | 17.05 | 1.29.08                                      |
| 13    | 1342 | May   | 5   | 30.46 N                | 0.25.00                     | 0.16.01         | 15.51                      | 16.01 | 0.32.02                                      |
| 15    | 1344 | Oct.  | 7   | 2.35 S                 | 10.42.46                    | 1.05.00         | 15.52                      | 15.02 | 2.10.00                                      |
| 16    | 1345 | Sept. | 27  | 20.54 N                | 4.10.58                     | 0.59.23         | 16.24                      | 15.56 | 1.39.46                                      |

To save space I have omitted the following columns which, combined under the general caption, "Coniunctiones vise solis et lune," occur in the chart between the day of the month and the latitude of the moon: Anni Arabum, numerus mensis, Name of the Arabic month, dies, hora, minuta, secunda. . Also the column giving the number of the Christian month (7 for July, 12 for December, etc.) which occurs between the columns for the Christian year and month.

Oppolzer lists eclipses for July 16, 1330, May 14, 1333, and Sept. 26, 1345. For the others his days of the month are the same.

TABLE OF SOLAR ECLIPSES FROM SLOANE 1110 (AND 2465)

| Cycle | Year | Month | Day | Initium  | (Sloane 2465)       | Puncta  | Tempus casus | Duratio |
|-------|------|-------|-----|----------|---------------------|---------|--------------|---------|
| 7     | 1448 | Aug.  | 29  | 21.22.13 | (Aug. 28, 20.16.02) | 9.15.04 | 1.05.14      | 2.10.28 |
| 7     | 1450 | Feb.  | 13  | 2.17.07  | (Feb. 12, 1.52.39)  | 0.18.02 | 0.24.27      | 0.48.54 |
| 10    | 1453 | Dec.  | 1   | 2.28.37  | (Nov. 30, 1.25.46)  | 9.59.39 | 1.02.52      | 2.05.44 |
| 17    | 1460 | July  | 18  | 15.42.00 |                     | 0.02.47 | 0.56.47      | 1.53.34 |
| 19    | 1462 | Nov.  | 21  | 23.27.15 | (Nov. 20, 23.00.25) | 1.09.01 | 0.20.50      | 0.50.40 |

<sup>27</sup> Harley 3731, fols. 196rb, 195vb.

TABLE OF SOLAR ECLIPSES FROM SLOANE 282 AND 2397  
(First comes the Golden number, then the Dominical letter)

|      |      |                          |          |         |                       |         |
|------|------|--------------------------|----------|---------|-----------------------|---------|
| 5 f  | 1448 | Aug. 18 b c              | 20.16.59 | 9.15.04 | 1.05.14               | 2.10.28 |
| 7 d  | 1450 | Feb. 12 a a              | 1.52.39  | 0.58.22 | 0.24.27               | 0.48.55 |
| 10 g | 1453 | Nov. 30 c <sup>1</sup> e | 1.25.46  | 9.59.39 | 1.02.52               | 2.05.45 |
| 17 e | 1460 | July 17 b c              | 15.42.00 | 7.02.47 | 0.46.47               | 1.53.34 |
| 19 c | 1462 | Nov. 20 b c              | 23.00.25 | 1.09.01 | 0.52 <sup>2</sup> .50 | 0.53.41 |

<sup>1</sup> c in Sloane 282, fol. 14v.

<sup>2</sup> 26 in Sloane 282.

Oppolzer lists solar eclipses for Aug. 29, 1448 and Aug. 18, 1449, Feb. 2, 1450, Nov. 30, 1453, July 18, 1460, and Nov. 21, 1462.

The above table of solar eclipses from 1330 to 1345 omits that of March 2, 1337, noted by Geoffrey of Meaux in connection with the comet of the same year,<sup>28</sup> and concerning which John of Genoa composed a separate treatise.<sup>29</sup> In a manuscript at Munich, an instruction for depicting a solar or lunar eclipse takes as examples the lunar eclipse of February 16, 1356, which is correct, and a solar eclipse of 1360.<sup>30</sup>

<sup>28</sup> *A History of Magic and Experimental Science*, III, 286.

<sup>29</sup> Noted by Duhem, *Le système du monde*, IV, 74, from MS 7281, ff. 208v-210v, of the Bibliothèque Nationale, Paris. Another MS of it is at Cambridge, University Library, Ee.III.61, ff. 75r-81r. On the fly-leaf of the latter MS is noted a solar eclipse of the afternoon of May 17, 1482; at ff. 12v-15r, the calculation of another

eclipse for the afternoon of May 28, 1481.

<sup>30</sup> CLM 10661, 15-16th century, fol. 170 (94)r-v: rubric, "Canon et modus pingendi eclipsim solis et lune"; incipit, "Eclipsim solis vel eam lune volens figurare pono exemplum. Primo de luna anno 1356 completo die 16 Februarii . . ."; desinit, ". . . et evenit (?) figura eclipsis solis ut hic pro anno 1360."



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# CHIROMANCY IN MEDIAEVAL LATIN MANUSCRIPTS

By LYNN THORNDIKE

IN Latin the earliest separate treatment of chiromancy as a distinct subject, art or science, appears to have been in translation from the Arabic — albeit somewhat dubiously — ascribed to Adelard of Bath<sup>1</sup> and John of Seville<sup>2</sup> of the twelfth century. In both cases Aristotle is sometimes named as the original author.

Of Latin manuscripts containing chiromantic texts none seems older than the thirteenth century. The printed catalogue so dates Vienna 2525, whose content is medical except for fols. 58r–59r: “Tres sunt naturales linee omnis chiros . . . / . . . haec in iuventute.” Sloane 2030 of the British Museum, a quarto on membrane, is dated in the long-hand catalogue of Sloane manuscripts as twelfth to thirteenth century, but is a collection of many MSS and fragments, some of which may even date back to the eleventh century, while several seem of the fourteenth. At fols. 125r–126v is the chiromancy ascribed to Aristotle, with the incipit, “Linee naturales tres sunt in planitie omnis ciros . . .” with two large figures of hands on 125v and 126r, and fol. 127 left blank. Meanwhile the text has ended on 126v, “. . . Hoc signum alicubi de pedum amissione. De oscullis alias agitur. Explicit.”

The late professor Haskins did not accept the ascription to Adelard of the translation of a text on chiromancy, writing:

We should not take too seriously the statement of a fragment on chiromancy in B.N., MS lat.n.a. 693, f. 97: ‘Sciendum est quod quaedam ars reperta est naturalis a quodam philosopho Edmundo qui antea fuerat Saracenus et vocabatur Maneanus, sed transtulit hanc artem magister Adulwardus de greco in latinum.’<sup>3</sup>

It is, indeed, unlikely that Adelard would translate a Saracen from the Greek. However, in a later manuscript of the fifteenth century, Plagens 144, Cpl (824)235, fols. 46–47 (recte 45–46) the *Chiromancia* which opens, “Linee naturales tres sunt . . .” closes

. . . et reperta a philosopho qui saracenus vocatus est et est translata ad nostram lingwam per Magistrum Adelardum. Explicit Chiromantia MinoR<sup>4</sup>

In another late manuscript, Sloane 323 at the British Museum, of the fourteenth to fifteenth century, figures of hands at fols. 188v–189r are followed by a text at 189v–191v with the similar incipit: Linee naturales in planicie cuiuslibet sciros sunt tres . . . but no author or translator is named.

In *A History of Magic and Experimental Science* (II, 77, and note 2) I suggested that John of Seville was perhaps the author of a chiromancy. But the evidence for

<sup>1</sup> Opening, “Linee naturales tres sunt in planitie omnis ciros . . .” See Lynn Thorndike and Pearl Kibre, *A Catalogue of Incipits of Mediaeval Scientific Writings in Latin*, revised and augmented edition, 1963, col. 830 for MSS and further bibliography.

<sup>2</sup> Opening, “Ciromantia est ars demonstrans mores et inclinationes . . .” *Ibid.*, 225.

<sup>3</sup> Chas. H. Haskins, *Studies in Mediaeval Science*, 1924, p. 25, note 31. The MS was of the thirteenth-fourteenth century. At the Bodleian, Oxford, a text with the same incipit in MS Ashmole 1471, late fourteenth century, fol. 82, was also catalogued by Black in 1845 as incomplete.

<sup>4</sup> I.e. minor. From Vielhaber, Godefriedo, and Indra, Gerlacus, *Catalogus Codicum Plagensium (Cpl.) manuscriptorum*, Lincii, 1918, p. 251.

this was slight and indirect. It is somewhat more likely that he translated the treatise which opens: "Ciromantia est ars demonstrans mores et inclinationes . . ."; and he is so represented as doing in a manuscript of the fifteenth century at Klagenfurt, Bischöfliche Bibliothek XXX.d.4, where chiromantic matter occupies fols. 235r-262v, of which 258v-262v contain figures of hands. The printed catalogue described all this as if it constituted a single treatise:

Johannes Hispalensis, Ciromancia Aristotelis et Averrois translata de arabico in latinum. INC (C) iromancie est ars demonstrans mores. EXPL Figura huius sequitur manus.<sup>5</sup>

In the manuscript itself, after the following headings:

- 243v 2a pars secundi tractatus de iudicio cutis
- 244r Tercia pars secundi tractatus de unguibus
- 244v Quarta pars secundi tractatus de pilositate

Sequitur tractatus tertius operis huius de modo operandi, we come at 245v to the following "Translatoris verba":

Et ego Iohannes Hispalensis hunc librum ab arabica lingua in latinam transtuli, et descripsi cum aliis multis bonis amore regine Hispalensiane elaboratum ex libro Aristotelis quem fecit Alexandro . . . De secretis secretorum in quo tractans Aristotelis (*sic*) multa bona descripsit de regimine principum quem quidam interpretes imperatoris iussu et magno labore transtulit, de cuius inventione in sua translatione arabica sic ayt, Egressus sum querere diligenter . . .

This passage, with its reference to John's translation of a portion of *De secretis secretorum* "with many other good books" for a queen of Seville, instead of the queen of Spain, for whom so far as we know, he translated only one brief extract, and its apparent allusion to the fuller thirteenth-century translation, sounds as if manufactured by someone else than John himself. The text therewith ends (at 245v, not 258r) Explicit textus ciromantie philosophi Aristotelis de temporibus servande. and is followed by a commentary upon it which accepts John of Seville as the translator.<sup>6</sup>

Other manuscripts fail to mention John of Seville in this connection.<sup>7</sup> The next mediaeval personage to whom chiromancies are attributed appears to be Albertus Magnus who died in 1280.

Some fuller account may be given of two chiromantic texts ascribed to Albertus Magnus to which I merely alluded in *A History of Magic and Experimental Science*, II, 575, note 2. In 7420A of Bibliothèque Nationale, Paris, of the fourteenth to fifteenth century, the text is followed by a commentary:

<sup>5</sup> Hermann Menhardt, *Handschriftenverzeichnis der Kärnten Bibliotheken*, I (1927), Wien.

<sup>6</sup> Fol. 246r: . . . sed causa efficiens Ioannes Hispalensis, tam materialis est ipsa manus et lineationes eius . . . This commentary in turn seemed to close on 247v. On John of Seville see my article in *Spectulum* xxxiv (1959), 20-38.

<sup>7</sup> Bern 353, fourteenth(?) century, fols. 6r-9r, and Munich cod. lat. 125, anno 1486, fols. 303va-307vb, ascribe it to Aristotle but say nothing of Averroes. In other manuscripts it is completely anonymous: Erfurt, Amplon. F.178, fourteenth century, fols. 44vb-47ra; London, British Museum, Arundel 88, anno 1485, fols. 59r-66r, and Sloane 513, fifteenth century, fol. 84v; Venice, St Mark's VIII, 44 (Valentinelli, XI, 105), fourteenth century, fols. 54-61.

Fol. 130ra, Incipit ars ciromancie edita a fratre Alberto de ordine Predicatorum. Cum aliquorum ignoranciam viderim de humani corporis proprietate(?) et dispositione, ideo de parte que est instrumentum corporis meum volo principium . . . et hoc domino concedente, et tale instrumentum dicitur esse manus et sciendum quod in manu sunt tres linee principales, alie vero non ita sunt principales . . .

At fol. 131 va the text closes

. . . sed nisi appareat, hominem leprosum esse designat. Explicit cyromancie textus editus a fratre Alberto de Colonya.

and the commentary begins

Incipit lectura eiusdem. CUM ALIQUORUM Quoniam aliqui optent scire de presentibus preteritis futuris . . .

On fol. 132rb is an "Additio cuiusdam expositoris," after which is written, "Explicit lectura, deo gratias. Amen."

In CLM 916, fifteenth century, fols. 25r–30v, the incipit is, "Cum igitur velim determinare . . ." <sup>8</sup> In the middle of 25v we read:

Iste liber in tria dividatur capitula, in primo determinandum de lineis principalibus, in alio capitulo de aliis

Further headings are:

26v, Deinde dicatur de media naturali

27r, Deinde de inferiori linea trianguli

28v, Dicto de lineis principalibus dicendum est de signis repertis in montibus

At fol. 30v text and manuscript end:

. . . secundum statum suum et ex solo signo non est iudicandum(?) sed ex pluribus. Explicit Cyromantia Alberti.

Both texts thus belong to the category which deals primarily with the lines in the hand. The attribution to Albertus, especially of the second, is very doubtful.

We pass on, to note in chronological order as nearly as may be, other manuscripts containing tracts upon chiromancy. In the Amplonian collection at Erfurt, in a duodecimo MS of the late thirteenth century (D.19, fols. 53r–62v) is a text which opens: (S)ecantur sciencie quemadmodum et res . . . and closes, . . . bonam dispositionem nature et materie.<sup>9</sup> The text is probably similar to that with a similar incipit in BN 7420A.

<sup>8</sup> Other MSS with similar incipits but no mention of Albertus are listed in *Magic and Experimental Science*, V, 674–75, namely, "Dum igitur velim determinare . . ." in Vienna 4007, 15th century, fols. 73–77; "Cum determinare vellim de ciromantica . . ." in Clermont-Ferrand 47, fols. 205–212, copied in 1474 by the Dominican Gelyra; CLM 657, fifteenth century, fol. 120; and at Florence, Riccardian 921, fols. 10v–19r.

<sup>9</sup> Wilhelm Schum, *Beschreibendes Verzeichniss der Amplonianischen Handschriften-Sammlung zu Erfurt*, Berlin, 1887, p. 776. For the similar incipits, *Scientie secantur* . . . and *Sequantur scientie* . . . see Thorndike and Kibre, 1963, cols. 1404, 1434.



It saves freedom of the will, arguing that chiromancy merely indicates natural inclination. Three parts of the hand are distinguished: the *recepta* at its base, the palm, and the fingers. Of the palm there are four principal parts and four principal lines and many smaller ones. Their continuity or discontinuity, color, angles, and figures formed by them are also taken into account, as are the mountains (*montes*) of flesh and joints of thumb and fingers. The forefinger was called the index; the middle finger, *medius*; the fourth finger, *medicus* or *medicina*; the little finger, *auricularis* (ear-finger).

A chiromancy in a manuscript at the British Museum is somewhat unusual and distinctive in first considering the size of the hand.<sup>10</sup> It is attributed at its close to Aristotle, but he is cited in the course of the work, as is Algazel.<sup>11</sup> The manuscript dates from the end of the thirteenth or beginning of the fourteenth century.

A large hand sometimes comes from labor as in the case of a carpenter, sometimes from nature. When it is because of large bones and muscles, its owner is strong and robust but not of a lively intellect. If it is large from fleshiness, its owner is luxurious and naturally an excessive drinker (*ebriosus*). If one has big hands and fingers sharp at their ends, he is lustful (*cupidus*) and false. If the fingers are broad, he is faithful and writes well (*bene scribens*). If a woman, she has a deep womb and much seeks a man (*et multum appetit virum*). If man or woman has a broad table in the hand and thin fingers, such a one is good at handiwork (*substantialis in operibus manuum*) and well disposed for playing harp or organ. Such a woman also has a wide womb in the anterior part and very narrow near the matrix. If man or woman has a small table in the hand and large fingers, he or she will die of an apostume, and she will have a wide womb near the matrix but narrow at the mouth of the womb. And such women are disposed to prostitution because of the width near the matrix. Those whose hands are neither too large nor too small are more normal (*convenientes*).<sup>12</sup>

A man with small hands is womanly and deceptive, vindictive and unstable. He may love profusely, but it soon turns to hate, and such a one is never to be trusted. In the case of man or woman, the hatred is as vehement as a serpent. But women naturally have small hands unless from work. If their hands are excessively small, their wombs are narrow at both ends and they do not seek a man unless one much beloved, and women of this sort are very difficult to have intercourse with. One with small hands is weak and timid in either sex. A true experiment is that a woman with greenish hands (*manus kyanos id est virides*) can quickly conceive but never delivers the fetus alive. One with coarse hands (*crassas*) is naturally luke-warm and dull. If such is a woman, "parum appetit

<sup>10</sup> Additional MS 15236, fols. 154r–160r, opening and closing: Ad sciendum artem ciromanticam. Primo oportet scire quantitatem manus deinde qualitatem et postea substantiam . . . / . . . et signa communia secundum ciromantium Aristotelis dictum est in precedentibus. Signa autem non communia sed particularia raro cadentia, quia sunt infinite relinquenda sunt ab arte. Explicit ars ciromantie Aristotelis.

<sup>11</sup> Fol. 154r, quia ut dicit philosophus accidentia conferunt ad cognoscendum; fol. 156r, Sed hic nota quod Algazel vult quod per cruces sub abrupticon et insuper significantur vices periurii.

<sup>12</sup> Fol. 154v, "sicut patet in antescripta figura signo tali." But no figures accompany the text in the present MS.

coitum sed multum potest coire." Such persons never agree well from lack of choler and blood.<sup>13</sup>

Those without a mass of flesh between thumb and forefinger, below the thumb, and in the palm, are naturally leprous, but members of religious orders do not have such bunches of flesh because of their vigils and slight use of their hands. One with thin (*graciles*) hands is very agile and ingenious and easily angered (*iracundus*) and lustful as a sparrow. Those whose fingers do not match or come together do not agree in their words and deeds.

Our text next turns from quantity to quality and takes up the lines of the hand and fingers. Another "experiment" which it notes is that when a line near the joint of the thumb is like a net composed of many lines and openings (*fenestre*), its owner will never enjoy his riches.

The third and briefest section on the substance of the hand also deals with its lines, and its title seems a misnomer.<sup>14</sup>

In Latin MS 15125 of the Bibliothèque Nationale, Paris,<sup>15</sup> of the fourteenth century, after figures of hands with numerous explanatory legends at fols. 56v–57r, a text opens at 57v: "Ista sciencia dicitur cyromancia a cyros quod est manus et magos quod est divinatio . . ." and ends at 59r "de aliis malis signis." Examples of the legends are: on the middle finger of the right hand on 57r, "Hic digitus immunis a signis signat mulierem liberam a curis terrenis," and, in the margin of the same page, "Si triangulus fuerit rubeus et planus, muliercula impregnatur." The text is made up of similar particular statements rather than arranged according to any general plan.

Another manuscript of the fourteenth century which contains a chiromancy is at Venice, St Mark's VIII.44 (Valentinelli XI, 105) at fols. 54r–61v, covering about forty lines per small quarto page. It begins with the incipit which we have already seen associated with John of Seville: "Cyromancia est ars demonstrans mores et inclinationes naturales hominis . . ." <sup>16</sup> The second paragraph runs:

Signa autem sensibilia manus sunt hec: quantitas, grossities, tenuitas, sudor seu humiditas, siccitas, calor, asperitas, levitas, pilositas, fixure et linea tres, et ista sunt signa naturalia, et ideo non se extendunt ad indicandum de accidentibus anime, quia non habent signa in manibus et transcendunt naturam.

The text then treats of the parts of the hand, the four principal lines in the palm, the triangle, and montes. Concluding heads are:

60r De lineis montis pollicis

60v De quantitate manus dicamus. De hoc dicit Arist. ad Alex.

61r De significatione cutis

61v De unguibus

<sup>13</sup> "Numquam inter se diligunt qui huiusmodi sunt quia non habundant in eis colera nec sanguis."

<sup>14</sup> Fol. 159v, "Tertio sequitur de substantia manus circa quod est sciendum quod aliquando habet lineas ultra consuetum modum prescriptum et tunc evenient ei fortuna ultra consuetum modum nature et aliorum hominum."

<sup>15</sup> Such MSS will henceforth be designated by the abbreviation, BN. I now have a photostat of the chiromancy in BN 15125.

<sup>16</sup> Valentinelli thought that it might be the translation by John of Seville, whose translation of the *Introduction of Albumasar* fills fols. 2–30.

The text ends: “. . . Et in hoc finitur ista optima et verissima cyromantia. Deo gratias.” The same manuscript contains the geomancies ascribed to Gerard of Cremona (at fols. 103r–157) and John of Murs (64r–99r).

At the Bodleian in Oxford the first ten numbered leaves of Digby 95, fourteenth century, are membrane; the remainder of the MS, which does not concern us here, is on paper. A passage on physiognomy from the Secret of Secrets at fols. 7r–8r<sup>17</sup> is followed by a “Cyromancia et palmastria” which should open “In principio Summe que dicitur ciromancia que considerat lineas palme tam naturales quam accidentales . . .” rather than “In primo sume . . .” etc. On fol. 8v are two figures of hands and more text, which then breaks off incomplete and is followed by blank leaves, while on the leaf numbered nine begin recipes of the fifteenth century for small pox, the eyes, headache, etc.

A somewhat similar situation prevails in the case of two chiromancies making up a membrane manuscript which has been bound in between the larger leaves of a paper codex, Vatican Palatine Latin 1892, and numbered fols. 123–132. They are neatly arranged and legibly written with large margins. The first tract, at 123r–126v, opens and closes:

Si linea vite sit grossa et inflata inter pollicem et digitum sibi proximum . . . / . . . Fit initium a complexione. Sed econtra operatione corrigitur. Explicit Cyromantia.

On 124v is a figure of a man reading a woman’s palm; on 125r, a large figure of a left hand with legends written on it; on 125v, a similar figure of a right hand. At 126r we read: “Iterato de iuncturis pollicis. Si linea pollicis in iunctura . . .”

Other MSS of the fifteenth century with the similar incipit, “Si linea iuncture pollicis . . .” are BN 6957, fols. 140v–143v, and at Munich, CLM 589, anno 1478, fols. 13r–15v, preceded at 1r–12r by Rules of Physiognomy by Iodocus and at 12v by a figure of a hand; CLM 916, 12r–14v., where it is likewise preceded by the Rules of Physiognomy at 1–11r, but without mention of Iodocus, and by a figure of a hand on 11v.

Bern 353 is a slim paper-bound manuscript of nine quarto membrane leaves from the fourteenth century which, except for a short tract on the cognate subject of physiognomy, opening at 5r, “Multitudo pilorum in ventrem luxuriosum . . .”, is entirely devoted to chiromancy. The first text at 1r–5r, “ex multis compilata,” has the incipit: “Cum diversi diversa de arte ciromancie scripserunt, ego volens ad aliquam certitudinem . . .” A similar wording opens texts in other MSS, while it was printed in 1490 at Ulm as by Aristotle. In Bern 353 the headings of its eleven chapters are:

1r Utrum ars ista sit licita

De modo iudicandi per hanc artem et unde dicitur ciromantia

De divisione linearum (the rest covered by the library stamp and blurred)

1v De lineis naturalibus quot sint at qualiter discernantur

2r De significatione linee vite et lineis naturalibus et accidentalibus

De linea mensali

<sup>17</sup> The same text is edited from other MSS by Robert Steele, *Opera hactenus inedita Rogeri Baconi*, Fasc. V, Oxonii, 1920, pp. 166–172.

- 2v De lineis que mensali linee adiacent quia multe sunt inter eam et digitos  
 3r De linea tabulari vel mediana  
 3v De linea prosperitatis et de ipsam consequentibus<sup>18</sup>  
 4r De triangulis in palma positos et de eorum significatione  
 4v De signis apparentibus in pollice

After instruction first to wash the hand in hot water (5v, "Ad habendum meliorem et certiolem inquisitionem manus aqua calida . . .") the title, "Cyromantia Aristotelis," is applied to the closing text at 6r–9r, which opens with the familiar incipit: "Cyromantia est ars demonstrans mores et inclinationes hominis naturales . . ." and which soon explains that it is easier to operate in this art after dividing the hand into its parts. The result is three treatises. The first deals with the lines of the palm and their significance, and the Bern MS breaks off in the midst of it.<sup>19</sup>

In Erfurt, Amplon F.178, mid-fourteenth century, fols. 44vb–47ra, the text, which opens similarly, "Cyromancia est ars demonstrans mores . . ." is carried farther to " . . . invenies veritatem deo annuente. Expl. secunda pars speculative." In the margin of 45rb are brief summaries of chapters 9, 10, and 11; in that of 45va, those of chapters 12, 13, 14, 15 and 16, while those for 1–8 seem squeezed into the binding between 44vb and 45ra, and there are none on 46. A huge figure of a hand with inscriptions on the fingers and a triangle in the palm fills the rest of 47ra, while rb is left blank.

In Erfurt, Amplon. Q.21, fols. 117–127, a slightly later MS of the fourteenth century, the desinit is " . . . vestes nigras plus amabit quam alias. Expl. ars ciromancie in Latino." Pars sixteen of the first tractate is reached at 124v; at 126r, "Pars tertia secundi tractatus que ungues . . ."; at 126v, "Saturnus facit subdolos tristes . . ."

In BN 7420A, a manuscript of the fourteenth century which also contains works of astrology and other forms of divination, as well as the more mathematical and astronomical textbooks of Euclid, Alexander of Villa Dei, and John of Sacrobosco,<sup>20</sup> a section from fol. 130ra to 142vb, is devoted to the art of chiromancy. First comes the treatise ascribed to Albertus Magnus of which we have already spoken. There follows at fols. 132va–135va, another chiromancy attributed to Aristotle, which opens and closes:

Incipit ciromancia Aristotelis philosophi. Cum enim humane nature sane disposite insit a natura sciendi desiderium . . . / . . . conciderationem circa prospiciantur ut falsa iudicia nullatenus privulgentur. Explicit cyromancia Aristotelis deo gratias etc.

Next is an anonymous treatise with the rubric, "Incipit cyromancia cuiusdam," and the incipit, "Linee naturales tres in planitie omnis cyros triangulum consti-

<sup>18</sup> In Vatic. Palat. lat 1892, fol. 132r, "et de eius lineis condependentibus."

<sup>19</sup> At 6v it had treated "de linea vite"; at 7r, "de linea mediana" and "De basi trianguli"; at 7v, "De triangulo et eius angulis"; at 8v, "Documentum utile," and "De significatione montium." It breaks off: " . . . Linea enim inter medium et medicum . . ."

<sup>20</sup> Paul Meyer, in *Romania* 26 (1897), 225–275, wrote on "Traité en vers provençaux sur l'astrologie et la géomancie," in it.

tuunt. . . .” It ends at the bottom of 136ra “ . . . incurrat iudicium. Explicit liber.”

At the top of fol. 136rb another text opens:

Cum cyromancia sit effectus sciencie alicuius futuri secundum quod eventus alicuius futuri potest comprehendi ex sexione seu diversitate sectionis linearum in manu et colorum diversorum in eadem . . .

and closes at the top of 138va:

. . . significat hoc quod deinde est de triangulo vel de angulo et melius qui sequitur de lineis que dicuntur sorores principalium linearum.

In between we hear of the line of life or cerebral line at 137va; at 138ra of the epatic line or line of digestion, and “when the whole triangle is equal.” Or,

Sometimes it happens that the line of life is joined in the hollow of the palm, and then the space of the triangle is restricted, and signifies misery, avarice, distress (138rb).

After this text of some nine columns, the rest of 138v is left blank.

Another chiromancy at fols. 139ra–142vb here opens, “Sequantur sciencie . . .”<sup>21</sup> and distinguishes three parts of the hand, its natural and accidental and three chief lines, which plant each is under. At 140va begins the second part of special judgments according to all the lines of the hand, also the palm and mountains. At 142va, *de bazi*; at 142vb, *de triangulo in generali*. Fols. 143–145 are then left blank.

Some account may be given of the fate which the lines of the hand portend. We have already had occasion to cite one desinit indicative of a bad ending — leprosy. A text which opens, “Si linea de iunctura pollicis de iuxta unguem sit totaliter circularis . . .”<sup>22</sup> is perhaps a latter part of a longer treatise but is found separately more than once.<sup>23</sup> The possessor of such a thumb line will be hanged or decapitated or at least die for his offense. There are some indications of good fortune for men, but the three for women at the top of the last page are all bad: made pregnant by her son, intercourse with her daughter, fornication with many men.

In manuscripts of the fifteenth century, the names of contemporaries appear as the authors of chiromancies. In Sloane 513 at the British Museum, fols. 100r–131r, that which begins, “Benedictus deus optimus . . .” is said to have been compiled at Florence on 31 January 1407, by “ego Ricardus” and that at 84r–96r with the incipit, “Ciromantie requiritur cognitio . . .” is ascribed to a Roderic of Majorca at the university of Oxford. It, however, is also found in an Escorial MS of the fourteenth century (p. III.8, ff. 19–51), and in Egerton 847 at the British Museum of the fifteenth century, quarto minori.<sup>24</sup>

<sup>21</sup> For other forms of this incipit, such as “Scientie secantur . . .” or “Secantur sciencie . . .” 2 see Thorndike and Kibre, *op. cit.*, 1404, 1416.

<sup>22</sup> BN 6957, fifteenth century, fols. 140v–143v. A figure of a hand occurs later at fol. 185v, between the *Antidotarium Nicolai* and a treatise on syrups.

<sup>23</sup> CLM 916, anno 1464, fols. 12r–14v: “Tabula seu Practica Ciromantis,” opening, “Si linea iuncture pollicis de prope(?) unguem fuerit totaliter circularis . . .”; also CLM 589, a.1478, ff. 13r–15v.

<sup>24</sup> The notice of Majoricis, Rodericus de, in A. B. Emden’s *Biographical Register of the University of Oxford to A.D. 1500*, II (1958), 1206, cites the other two MSS, but not Sloane 513.

Both works are notably astrological. Richard has chapters upon Jupiter, Venus, Mars, the sun, Venus again, Mercury and the moon. The knowledge which Roderic finds necessary in chiromancy is of the moon.

In one of the manuscripts where we noted a chiromancy attributed to Albertus Magnus, is another ascribed to Laurentius Mandelkern and dated in 1464. CLM 916, 15r, figure of a hand; 15v, blank, as are the next two unnumbered leaves; 16r, incipit, "Philosophantes antiquos oro . . ."; 24 r, "Explicit opus magistri Laurentii Mandelkern anno domini milesimo CCCC<sup>o</sup> lx<sup>o</sup> quarto." The text, in eight or nine chapters, is poorly written and often illegible.

The chiromancy which opens, "Scientie secantur . . ." is in some MSS ascribed to Regiomontanus (died in 1476).<sup>25</sup> To him is further attributed by Zinner<sup>26</sup> a work on astronomy, astrology, and chiromancy in a Vienna MS (5203, 15c, ff. 133-134v) which opens: "Astronomia et astrologia in hoc differre videntur . . ."<sup>27</sup> The names of Antiochus Tibertus<sup>28</sup> and Andreas Corvus belong to the age of incunabula rather than to that of mediaeval manuscripts.

We may continue the latter by some account of a folio at Munich, written on paper in 1486. The contents of CLM 125 are primarily astrological, but fols. 301-309 are devoted to chiromancy. Of the three tracts, two are roughly identical with those of Bern 353. At 301ra the incipit, "Cum diversi diversa . . ." continues, "loquuntur de arte ciromantie, ego volens ad certitudinem reducere confusa et dubia (in) vera . . .", while cap. xi ends at 303va, "et scias quod meliora que de ista reperi recollegi. Explicit feliciter. Amen."

The distribution in eleven chapters begins: "Primum videndum est utrum ista ars sit licita . . ."

- 301rb, cap. 2, Consequenter linee manus sunt dividende
- 302ra, cap. 3, De significatione linee vite
  - cap. 4, Linea mensalis
- 302rb, cap. 5, Si inter lineam mensalem et digitum . . .
- 302va, cap. 6, De media linea
- 302vb, cap. 7, Linea prosperitatis
  - cap. 8, Nunc de triangulis
- 303ra, cap. 9, Si in superiori pollicis
  - rb, 10, Si in palma inter lineam tabularem (pr., mediam) et lineam vite . . .
  - 11, Si manus in palma et digitis sit quasi . . .
- 303va, It ends, and Ciromancia est ars demonstrans mores et inclinationes naturales hominis . . . begins, here ascribed to Aristotle, and in 19 chapters, of which
- 304rb, cap. 5, De basi trianguli, which is not found in many hands or only in senectute
  - va-b, 6-8, The three angles of the triangle

<sup>25</sup> Thorndike and Kibre, *op. cit.*, 1404.

<sup>26</sup> Ernst Zinner, *Leben und Wirken des Johannes Müller von Königsberg genannt Regiomontanus*, Munich, 1938, p. 221.

<sup>27</sup> I have not examined this MS.

<sup>28</sup> The MS in the Laurentian library at Florence, Plut. 89 sup., cod. 35, f. 217 *et seq.* may be made from an edition.

- 305rb, cap. 9, . . . nunc de mensali . . . que nuncupatur et moralis eo quod per eam  
multi mores innotescant
- 305va, cap. 10, De significatione montium et primo de monte indicis
- 306va, 15, De lineis pollicis  
vb, 16, De quantitate manus
- 307ra, 17, De significationibus cutis secundum Albertum et . . .  
rb, 18, De unguibus  
19, De pilis  
It ends, . . . et si quandoque signa contraria inveniuntur, fortioribus et  
pluribus est adherendum. Et tantum de isto tractatulo.
- 307va A treatise which is chiefly occupied with the lines of the hand, opens, Si  
linea vite sit grossa et inflata inter pollicem et digitum sibi proxi-  
mum . . . <sup>29</sup> and closes at
- 308rb . . . complexionatus ad unum vel oppositum verius(?) resistente. Sequ-  
unter autem ad hunc ultimum tractatulum ciromantie due sequentes  
manus.
- 308v-309v Three figures of hands occupy.

John Metecham, or Metham, tells us that he translated the chiromancy of Aurelian out of Latin into English when he was twenty-five years of age, and that he composed the poem, *Amoryus and Cleopes*, during the reign of Henry VI. The text of his translation of Aurelian, which opens, "Tales Milesius the wyche was the firste phylosophyr . . ." goes on to say that Thales wrote in Persian, that Aristotle translated him into Greek, and Aurelian from Greek into Latin. This English text has been edited from both a Garrett and All Souls College manuscript on opposite pages by Hardin Craig, *The Works of John Metham*, London, 1916, in the publications of the Early English Text Society, original series, vol. 132, where at pp. xix-xxviii are listed many British chiromantic manuscripts.

But Craig seems to have failed to note that the *Summa chiromantie*, ascribed vaguely to a John the philosopher, is also found in the All Souls manuscript. It is now edited as the appendix to this article, and is a very detailed treatment, taking up not only the principal lines and mountains of the hand, but noting the meaning of the minutest lines and marks, and relating these not only to good and bad fortune in general, but to the clergy, crime, and punishment, and to sexual life and vices in particular. Thus it is sociological as well as superstitious. It is quite careless, however, — or its scribe and copyist is — in matters of spelling and grammar, though the meaning is usually clear enough. I have sometimes, not always, corrected it, sometimes and again not always indicating the incorrect reading of the manuscript. Its use of u and v has been retained, for example, *vsque*. It appears to have been composed or copied in the later fifteenth or early sixteenth century. Abbreviations and contractions are frequent, and these have been expanded according to the usual practice and not as this particular scribe might have done. A prominent feature is the figures of hands and the reference to them of numbers in the margins of the text, which may be summarized in the accompanying tabulation.

<sup>29</sup> This incipit has already been encountered above in MS Vatic. Palat. lat. 1892.

Figures of hands in the *Summa chiromantic* of John the Philosopher  
from ALL SOULS 81, Oxford.

| fol. | opposite<br>lines<br>(of text) |  |
|------|--------------------------------|--|
| 240r | 22-31                          | Names of fingers etc. inscribed, but no numbers given  |
| 240v | 21-33                          | 1, 2, 3  |
| 241r |                                | no hand shown  |
| 241v | 7-20                           | 4, 5, 6  |
| 242r | 7-19                           | 7, 8, 9, 10  |
| 242v | 14-29                          | 12, 13, 14, 15, 16, 17, 18, 19   |
| 243r | 16-26                          | 19, 20, 21, 22, 23, 24, 25   |
| 243v | 12-25                          | 22, 30, 31, 32, 34, 36, 37, 38, 53   |
| 244r | 19-30                          | 39, 40, 41, 42, 46, 48, 49, 50, 51, 52, 55, 56, 57, 60, 61, 77, 79, 80,                                    |
| 244v | 20-32                          | 65, 66, 68, 77, 78, 79, 80, 82, 83, 89   |
| 245r |                                | no hand shown  |
| 245v | 5-18                           | 86, 91, 95, 96   |
| 246r | 3-14                           | 35, 96, 97, 99, 100, 2, 3, 4   |
| 246v | 3-15                           | space left for a hand but not filled in  |
| 247r | 3-15                           | big and little hand with dots on fingers but no numbers  |
|      | 23-31                          | 5, 6, 7, 8, 9, 10, 11, 12, 13, 14  |
| 247v |                                | no hand shown  |
|      |                                | Figures of hands are thereafter fairly frequent but are mostly inscribed<br>only with words or lines until |
| 258r | 9-23                           | occurs one with many numbers corresponding to those in the margin<br>opposite the text on 258r-v           |

#### APPENDIX

JOHANNES PHILOSOPHUS, *Summa Cyromancie*: ALL SOULS COLLEGE, OXFORD, 81,  
15-16TH CENTURY, Fols. 240r-258v

Quoniam revelante domino, in cuius pectore sunt omnes thesauri sapientie et scientie reconditi, futurorum eventus prenoscuntur, ut eo perturbent maiusve letificent quo preuideantur.

Ego Johannes philosophus ex codicibus philosophorum de arte ciromancie tractatus flores collegi et in presenti libello compilavi, quem et libellum summam cyromancie volumus appellari.

Est igitur cyromancia sciencia cognoscendi diuersas inclinaciones virtutum et viciorum ac et passiones naturalium fortunium et infortunium cuiuslibet per signa sensibilia manus atque linearum in manu existentium que duplici modo considerantur.

Linearum enim quedam sunt naturales et quedam accidentales. Accidentales vero vocamus quia accidentaliter generantur vt a fame, calore, frigore, sit(i), infirmitate et consimilibus, de quibus in hac arte minime est dicendum nec curandum.

Naturales autem in manu sunt quatuor et hee a diuresis diuersimodo nuncupantur.

Quarum prima est dextra trianguli vel supprema in triangulo et circuit pollicem. Ortus autem eius est inter indicem et pollicem, et terminatur versus raficam manus. Et dicitur a philosophis quod eadem linea correspondet cordi.

Pars vero manus que est inter eandem et primam iuncturam policis, mons pollicis sive pectus manus vocatur.

Secunda linea mediam (*sic*) vocatur eo quod per medium manus extenditur vel sinistra trianguli, que inter pollicem et indicem velut prima habet initium et in profundum palme producit. Et hec linea correspondet cerebro.

Tercia linea basis trianguli nominatur eo quod ex predictis duabus tangitur et ex eis triangulum fit, et correspondet epati.



Totum autem spacium inter predictas lineas contentum, illud triangulus vel manus concauum nuncupatur.

Et est notandum quod, si linea sit bona, designat bonitatem illius membri cui correspondet (correspondes in MS).

Saturnus habet medium cum suo monte; Jubiter, indicem cum suo M; Mars, triangulum; Sol, auricularem cum suo m; Venus, pollicem cum suo (secundum in MS) m; Mercurius, medicum cum suo (secundum in MS) m; Luna, mensalem cum quadranguol (quartum in MS) et partes infra basim trianguli possidet.

Quarta linea mensalis vocatur eo quod inter illam et mediam ad modum mense illud spacium relinquitur que et mores hominum ostendit, et tres digitos, scilicet medium, medicum et auricularem. Et correspondet membris generatiuis.

Partes ille que sunt inter lineam mensalem et radices (240v) trium digitorum, montes scilicet medii, medici et auricularis dicuntur. Illa autem pars que est inter dextram trianguli et radicem indicis, mons indicis appellatur.

Igitur secundum maius et minus iudicare debet sapiens. Quoniam si plures linee in medio digito qui est digitus Saturni quam alibi in parte alicuius alterius plage appareant, signum est themum nativitatem et condiciones habere Saturni. Secundum hanc regulam in ceteris partibus planetarum intelligitur. Hii sunt animati, utilia consulentes, diu in cogitatione permanentes, et per longas terras erunt peregrini, et ita de condicionibus aliis plane convenientibus iudicamus, ut alibi plenius erit tractatum.

1 Dextra trianguli, si (scilicet in MS) longa appareat, bonum finem denunciat. Si vero minor, contrarium signat. Si autem sit longa ita quod extendatur ad raficam manus vel prope, continua, recta, eiusdem latitudinis per totum, decenter profunda, longitudinem vite et cor bene dispositum ostendit. Raro tamen aut numquam optata ad finem perducet. Si autem sit stricta et bene colorata, subtilem et boni consilii hominem atque legalem ostendit. Si profunda, grossa et terrestris coloris; ruditatem, gulam et bestialem vitam signat. Si rubea fuerit et inordinate punctata, illud luxuriam designat. Si autem sit grossa et inflata inter pollicem et indicem, illud signat inclinationem ad homicidium.

2 Sinistra trianguli que dicitur mediana, si directa fuerit et continua, bonam complexiorem, sanitatem et bonitatem ingenii signat. Si hec linea longa sit decenter ita quod non excedat concauum manus, illud pauidum, avarum et modice rationis hominem, et si quid promiserit, illud promissionis penitentem designat.

Si autem extendatur ad inferiorem partem manus ex opposito auricularis et ibi finiatur, hominem parve vite denunciat. Si vero porrigatur ultra montem indicis, hominem longe vite designat sed in senectute egentem. Et si ad digitos multum inclinet, illud maxime stultum denunciat.

Si hec linea fuerit tortuosa, illud malicias tractantem et consilia revelantem signat. Si autem fuerit nimis lata et profunda, illud defectum providencie et ruditatem ingenii designat. Si autem hec linea in fine ad suos digitos vertatur, nequam et imprudentem hominem indicat. Si vero in modum (241r) crucis manum secat, mortem propinquam et infra annum futuram signat. Si hec linea non habetur, illud signum est morbi caducis. Sed alie due linee non potest abesse nisi in operantibus.

3 Linea trianguli que basis appellatur, illa quandoque in manibus apparet et quandoque disapparet. Que, si satis longa, profunda et lata (latis in MS) decenter et continua, bene colorata appareat, illud bonitatem stomachi et epatis, leticiam et audaciam signat. Si econtrarium, illud contrarium signat. Si autem hec linea non appareat, signat dolorem et cutis subtilitatem, coleram et eius condiciones: agilitatem corporis, irasci velociter, cito loqui, vina forcia et cibos calidos leviter amare.

4 Linea mensalis, si sit continua, profunda, lata et recta, bonam dispositionem membrorum superiorum et virtutem fortem in membris generativis denunciat, et perseveranciam in operibus protestatur. Si hec linea ultra montem indicis elongetur et rubia sit, illud signum est crudelitatis et ire; si pallida, detractionis et invidie. Si autem inter medium et indicem directe transierit, in viro ille absque dubio volnere aut fluxu sanguinis morietur. Si mulier est, aut fluxu sanguinis aut partu morietur. Si vero versus digitum

medium inclinet et citra eundem terminetur, iuvabitur a fortuna, sed adulatorem esse, et amicum unicum habere dicitur, et a propinquis ledetur. Si caput huius lineae infra eundem digitum finiatur, numquam sine angustiis, tribulacionibus et laboribus erit. Si hec linea diuidatur prope caput et predictae vadant inter medium et indicem, sufficienciam in victu (et) vestibus ostendit, sine cogitacionibus vivet, aliquando lucrabitur pro eo et a mulieribus diligetur.

- 5 Si hec linea habeat ramos erectos ad inferius, illud signum est exaltacionis et honoris gradatim prouenturorum. Si autem sit nuda et sine consimilibus ramis procedat, infortunatum et sine diuiciis virum.

- 6 Quando autem dicta linea vadat ad montem indicis et ibi finiatur, et ex altera parte eius quidam ramus radicem pollicis respiciat, illud virum convexae fortunatum, dulcem in animo denunciat et largum.

Si vero caput vel ramus huius lineae superius vadit ad lineam mediam naturalem circa triangulum, cupidum signat et adulatorem, verbis coram placentem et retro sicut scorpio pungentem. Et si eadem linea cum media naturali et dextra trianguli coniungantur ita quod ille tres vnum angulum constituent, in tanto erit timore et periculo quod peniteat eum natum fuisse. Si vero hec linea cum dextra trianguli iungatur et cum ea triangulum constituat, et ibi non fuerit linea naturalis media, decapitabitur aut improvise vulnere cadet. Si autem hec linea mediam (241v) naturalem respiciat, ille erit in periculis et timore mortis, se pene euadet per mulierem. Quando autem hec linea habet grossas et inordinatas cephras(?) aut punctos rubeos cum hoc quod color eius sit rubeus, luxuriam signat.

- 7 Mensa manus quae dicitur quadrangulus, cum lata sit et ampla, largitatem, bonam dispositionem et amicitiam designat. Si stricta, auariciam, discordias et inimiciam(n)s signat. Si autem fuerit plana et bene colorata, audaciam et largitatem animi signat.

- 8 Triangulus equalium laterum vel prope, plurimarum litterarum bene coloratarum, signum est fortitudinis nature, longe vite, amicitiae, perfecte fidelitatis et excellentis fame. Cuius spacium, si latum fuerit et planum, satis magnum et bene coloratum, largitatem et audaciam ostendit. Si e contrario, e contrarium signat. Est aduertendum quod angulus ille qui constituitur a dextra trianguli et linea media naturali angulus supremus in triangulo nuncupatur. Ille autem angulus qui constituitur a dextra trianguli et linea quae dicitur basis trianguli angulus dexter dicitur. Angulus vero causatus ex basi trianguli et media linea naturali angulus sinister dicitur.

- 9 Angulus ergo supremus, si in concavitate manus quae est ex opposito illius spacii quod est inter medium digitum et indicem appareat, illud miseriam vite et pessime conscientie hominem, auarum et minime veracem ostendit. Si autem ultra medietatem indicis iaceat ex opposito vel citra, et acutus fuerit quasi sit una plicatura medium (?), scilicet et dextre trianguli, signum est auaricie et tenacitatis. Si obtusus fuerit, illud prodigum et absque ratione expendentem ostendit. Si vero predictae lineae, media scilicet et dextra trianguli, coniunguntur recte ex opposito medietatis indicis, angulum acutum faciendo, tunc signum est subtilitatis ingenii, expendentis moderate, felicitatis et inculpabilis vite. Aliquando tamen accidit ibi angulum non esse sed notabiliter predictae lineae distare videntur et tunc miserum, viciosum, crudelem, mendacem, (242r) malum debitorem, iactantem vanos et inictiles sermones proferentem indicat.

Qui, si servus aut captivus fuerit, numquam liberabitur. Si vero liber fuerit aut dominus, ille misera vita finietur, licet rex vel princeps fuerit.

Quando autem prefatae lineae non notabiliter distant sed sunt valde propinque, tunc pugnans in bello morietur.

- 10 Angulus dexter, si rectus et bene coloratus fuerit, bonitatem stomachi et epatis bonam dispositionem, cordis virtutem fortem et bonam digestionem ostendit. Si fuerit acutus, signat auariciam. Et quanto acucior, tanto auarius indicat. Si autem fuerit obtusus siue grossus, ruditeriam rationis dante, virum pigrum, sompno lentem et negligentem indicat. Quod si angulus non appareat, lineis distantibus, varietatem et instabilitatem animi ostendit. Cui fides non est aut constantia. Non enim de aliquo si possit quod desiderat

adimplet, et talem virum pessimum reputamus.

- 11 Angulus sinister, si rectus fuerit et bene dispositus, bonitatem signat intellectus et sensuum, atque longissimam vitam insinuat. Quod si acutus, maliconsum\* et cautelosum. Si obtusus, ruditatem ingenii ostendit. Si autem non sit ibi angulus, debilitatem stomachi et epatis signat.

Quoniam concauum manus montibus circumdatur digitorum, ut iam pretaxatum est, nunc de illis specialiter dicamus et primo de illo qui ad dextram trianguli terminatur.

- 12 Si igitur mons pollicis sit rotundus, decenter lenis et bene coloratus, bonitatem complexionis ostendit; necnon vestium ornamenta et mulieres diligentem ostendit.
- 13 Et si quedam linea in hoc loco iuxta dextram trianguli reperiatur, iacens secundum longitudinem lineae quae a quibusdam soror dextre trianguli appellatur, si hec fuerit rubea, illud maxime luxuriosum signat et talis naturaliter inclinatur ad concubitas masculorum et multum delectatur in tangendo et fricando manibus propriis pudenda. Et dicunt cyromantici quod si hec (242v) sit continua a radice manus vsque ad supremum angulum trianguli et in ea sit pulcher color, diuicias et delicias in tota sua vita signat habiturum. Quae si non appareat in principio sed in medio vel in fine, illud pauperem in prima etate et divitem in secunda vel ultima etate denunciat. Si tamen quaecumque pars huius lineae deficiat cum hoc quod aliqua pars illius appareat in principio, in medio aut in fine, in tali loco quo non appareat intempore etatis correspondente defectum patietur diuiciarum.
- 14 Et dicunt quidam quod si a latere huius montis versus brachium quatuor lineae quasi edistantes versus eminenciolem partem pollicis reperiuntur, diuicias et honores in prima etate signant.
- 15 Et si dicte lineae prope iuncturas pollicis inueniantur, in secunda etate.
- 16 Et si inter iuncturas pollicis fuerint, in ultimo etatis suae peruenire pronosticant. Quanto autem profundiores, grossiores atque longiores fuerint, tanto maiores honores et diuicias ostendunt. Si fuerint intercise, (illud) earum significationes sunt impeditae. Si vero fuerint delete, signum est quod significationes illarum sunt transactae.
- 17 Si quedam linea .g. radice a radice pollicis vsque ad dextram trianguli transeat a latere manus vsque supremum angulum trianguli, talem cupidum honoris atque laudis, inanisque glorie et luxurie plenum denunciat. Et si talis linea in alio latere montis versus manus radicem inueniatur et a monte eodem procedit, sollicitum circa cumulationem pecuniae denotat. Et si tales lineae delete, fractae aut intercise fuerint, suarum significationum impedimentum designat.
- 18 Mons indicis, si fuerit mundus, lenis et bene coloratus, honestatem vite et iusticiam indicat.
- 19 Si quedam linea oriatur a mensali recta, longa et bene colorata, et ad indicem transierit et circa eius primam iuncturam terminauerit, excellentem, audacem et minime pauidum denotat. Et si talis linea intersecatur iuxta radicem indicis a quadam vel a quibusdam lineis, circa caput plagas ostendit. Si rubie fuerint, futuras. Si pollice aut delete, preteritas.
- 20 Mons medii, si fuerit sine lineis bene coloratis, (243r) simplicem, quietum, sine cogitatione et calumpnia denotat.
- 21 Si autem quedam linea ex mensali oriatur et in radicem illius digiti se porrigat, dure et maxime laboris signum est.
- 22 Si plures ibi appareant, labores, angustias, calumpnias et temptationes ostendit, et talis quandoque vincula sustinebit. Si tales lineae in concauum manus veniant et per iuncturam digiti medii contentantur et ultra iuncturam finiantur, (illud) licet rex fuerit, in vinculis morietur.
- 23 Mons medici, si lineas duas habeat eque distantes a linea mensali, ad radicem medici porrectas, subtilitatem ingenii denotat, diuersarum artium inuestigatorem, eloquenciam, arroganciam et inanem gloriam affectantem, et secundum alios honores et dignitates

\* Not in Du Cange or the *Medieval Latin Word-List*, Oxford, 1934.

seculares vel ecclesiasticas ostendit. Et si linee impedimentes preueniant eas et non tangent, signum est tale impedimentum prope fieri, sed tamen non erit impeditus. Si autem predictae lineae a linea mensali non equaliter procedant, nec ipsi digito equaliter appropinquant, quarum una sit maior, altera minor, mutabilem uitam et statum denotat. Si quedam offendit unam utrarum(?) et illa quae offenditur sit maior, mutabitur in peius; si minor (miror in MS), in melius.

24 Mons auricularis. Si quandam lineam rectam, notabilem, decenter coloratum et subtilem, a linea mensali et ad radicem auricularis transiuntem habuerit, in viris auariciam, in mulieribus castitatem denotat, et secundum aliquos virginitatem in muliere signat.

25 Et si quedam lineae in hoc loco reperiuntur quarum quedam sunt maiores et quedam minores et quedam mediocres, et signum est luxurie et amorosi hominis. Et dicunt quidam, si iste lineae fuerint recte et bene ordinate, illud amor erit circa nobiles mulieres valentes et guerosas. Si inordinate et tortuose, circa viles et ignobiles personas versabitur. Si vero predictae lineae sint intercese, interciditur earum significatio. Et haec regula valet in omnibus.

Hec omnia in arte cyromantica circa viros et mulieres sunt considerata ut videas quod manus aqua calida lauentur et sint desiccate (243v) et bene fricate, ut lineae bene appareant et sit tempus clarum. Et non solum propter unam significationem pronosticare debes (illud) sed penes plura signa conuenientia dabitur iudicium. Et nota quod principalia viri iudicia in manu dextra consistunt et mulieris in manu sinistra. Utramque tamen manum respicere utile tenemus vel reputamus.

Quando in iuncturis quatuor digitorum est nisi una linea prope manum, mortem quasi subitam ostendit. Si vero plures, ille longam infirmitatem ostendunt et cum difficultate vitam finire.

35\* Quando in iunctura pollicis iuxta manum una fuerit linea continua, diuicie sibi prosunt. Si plures et discontinue atque disperse, dispergentur etiam diuicie.

36 Si quedam parua crux in digito auriculari reperietur, fatuum designat.

27 Si quedam linea recta a radice auricularis exorta super eius mediam iuncturam transierit, subtilitatem ingenii denunciat.

32 Hec linea brevis et lata inter hos digitos extensa temeritatis est nota.

29 Hec lineae vulnera magna significant.

28 Hec linea notabilis et bene colorata, inter medicum et auricularem apparens, excellentem statum et largitatem signat.

30 Hec sunt signa vulnerum in femore, magna futurorum, parua preteritorum.

31 Lineae per medium trianguli extense submercionem signant.

33 Si quedam linea recta et bene colorata a radice indicis oriatu et vsque ad mediam eius iuncturam vel prope se porrigat, audaciam et honores indicat.

34 Hec lineae signa sunt vulnerum in capite; late futurorum; parue, preteritorum.

36 Hec linea inter indicem et medium signum est mortis ex vulnere. Et si sumat medium, et extendatur alia super indicem, mortem subitanam insinuat.

37 Hec lineae parue descendentes a radice medii plagas in ventre et pectore ostendunt. Si rubie, futuras; si pallide, preteritas. Eritque talis luxuriosus.

38 Si quedam lineae in hoc loco venientes ex dorso manus inter lineam mensalem et radicem auricularis appareant, quot lineae ibi post primam fuerint, (244 r)\* tot nuptias et in clerico tot promotiones notant. Sed si fuerint intercese, defecit earum significatio. Quae, si recte fuerint, virgines; si tortuose, corruptas; si flexe, viduas designant.

39 Si quedam linea quasi semicircularis a radice auricularis procedat, medicum respiciens, illud mutationem status ad bonum signat. Si autem talis linea curua inferius versus dorsum manus respiciat, mutatio ad malum erit.

40 Si quedam crux parua in hoc loco reperiatu, adulatorem signat.

41 Hec linea auricularem ingrediens, mutacionem signat.

42 Hec crux est signum vite qua exeunte exiet vita.

\* Henceforth the marginal numbers cease to observe a consecutive order.

\* In the top margin of the page is written: dexter virum signat.

- 43 Si quedam aspersa et tortuosa inter medium et medicum reperiatur, stulticiam signat.
- 44 Si quidam triangulus in hoc loco appareat, infortunatum et deterioratum signat.
- 45 Si quedam linee grosse et curte in hoc loco fuerint, quietem designant. Sed si alia linea eas intersecat, signum est laboris.
- 46 Si quedam linee in hoc loco coniuncte fuerint, digitum medium respicientes, futurum bonum administrant. Et hoc idem in monte indicis intelligo.
- 47 Hec crux parva bene colorata in hoc monte reperitur; dignitates et honores denotat.
- 47 Si quedam crux parva ex opposito illius partis que est inter medicum et auricularem in quadrangulo reperiatur, peregrinationes et multos labores indicat.
- 49 Crux sub mediana signat diuicias querere cum pena et labore, et a casa vel precipicio peribit.
- 50 Crux descendens trianguli, si eius hasta subtilis sit, mortem signat, et quanto se ostendit hasta ulterius, tanto mors est vicinius.
- 51 Si de linea de abrupto crescunt parve linee, ille meantelosus\* erit et non de facili credens, quia ad vana et astucies et dolos dispositus erit.
- 52 Si quedam linee parve a radice indicis, bene colorate et recte, procedant tendentes ad inferius bonum signant, et quanto propinquiore ad digitum, tanto plura bona designant, Ille augmentabitur in bonum et ab excellenti persona honorabitur. Et secundum quosdam, si clericus fuerit, tot prebendas et ecclesiasticas dignitates; si laicus, tot magnas honores ostendunt et secundum aliquos tot volnera in capite signant.
- 53 Si quedam linee eque distantes a capite medii naturalis (244v) oriantur et in montem indices transeant, ille verecundum et promissa tenentem indicant.
- 54 Si quedam linea veniat ex monte indicis simul(?) ex quadrangulo et vadat inter indicem et medium, ex plaga vel fluxu sanguinis morietur.
- 55 Si quedam linea veniat a capite mensalis ad radicem indicis, mortem subitam ostendit.
- 56 Si quedam linee recte, bene colorate, veniant a radice pollicis vsque ad dextram trianguli, longas peregrinationes et diuersas patrias querentem ostendunt.
- 57 Si multe linee late, grosse et inordinate in monte pollicis inueniantur, ignotis amicis libenter nutrantem(?) ostendunt. Et si tales linee sint intercese glomerate et transuerse, mendacem, instabilem et fornicatorem ostendunt, et secundum alios homicidam nominant(?).
- 58 Si quedam figura similis stelle in monte pollicis inueniatur, risum, letitiam et meretricum concubitus denota(n)t.
- 59 Si quedam linee talis figure — in hoc monte reperiantur, honores et dignitates ostendunt.
- 60 Si talis figura in hoc monte fuerit vel sibi similis iuxta dextram trianguli, cito infirmabitur et secundum quosdam infra annum.
- 61 Si in monte hoc iuxta radicem manus sunt multe linee perpendiculares cadentes scilicet secundum citum ab abrupto, erit dives. Mulier habens manus grossas, illa est naturaliter ebes, et talis parum appetit coitum cum possit coire, sed non diligit intense, quia tales sunt frigide, et viri in coitu talium parum delectantur.
- 62 Si quedam linea veniat ex monte indicis simul ex quadrangulo et vadat inter indicem et medium, in muliere signat mortem ex partu vel fluxu.
- 63 Si linea mensalis inter medium et indicem directe in manu mulieris transierit, fluxu sanguinis vel partu morietur.
- 64 Si linea mediana naturalis inter pollicem et indicem intumescat, illud signat impregnari, que si diuersis fuerit coloribus, illud cum pluribus viris signat fornicari.
- 65 Si multa sordida(?) appareant in triangulo manus mulieris rubea, intercepta, prenantem indicat. Que si in medio trianguli fuerint, ex adulterio concepit.
- 66 Si autem in parte inferiori angulus fuerit planus, signat masculum ferre.
- 67 Si vero figura (245r) id est circulus ibi fuerit, illud filiam designat periticiam. Mulier habens digitos longos subtilis est. Linee graciles et pallide in muliere ieiuno stomacho

\* Perhaps melancholicus has been miscopied. . . . See also maliconsum above.

virginitatem signant. Late, rubie et fracte et inflata corruptari demonstrant

Quot linee recte et manifeste inter duas primas iuncturas auricularis in muliere fuerint, tot habebit filios et quot oblique, tot filias.

69 Quot linee magne sunt hic, tot viros ducet.

70 Hee plures linee magne meretricem signant.

Hee linea magna signat amissionem virginitatis.

72 Quot linee lineam medianam dividerunt sine hoc quod inferiorem lineam tangat, tot partus in muliere denotant.

73 Exeunte hac (hanc in MS) linea, scilicet mediana, exiet et vita.

Si quedam linea recta, notabilis, decenter colorata et subtilis a linea mensali ad radicem auricularis transierit, in mulieribus castitatem et secundum alios virginitates significat.

75 Signa diuiciarum in iuuentute.

76 Signa diuiciarum in media etate.

Hee linee signant diuicias in senectute.

78 Iste semicirculus male dispositionis et proxime infirmitatis est signum.

79 Multe linee (sic) vel una longa in medico signat amorem. Si linea basis mulieris sit furcata vel bifurcata versus brachium, malam mortem signat propter furta aut alia huiusmodi.

80 Si in monte manus mulieris fuerit talis signa —, casu vel precipitatione peribit. Digitus medius, si fuerit immunis a signis, mulierem liberam a curis temporalibus ostendit. Et si multe linee in illo fuerint, raro egebit.

81 Quot fuerint linee recte inter medicum et auricularem, tot habebit mulier filios vel plures.

82 Si supra(?) dorsum indicis mulieris reperitur hec signa —, luxuriam signat.

83 Si in manu mulieris vel in eius digito medio fuerit signum quadratum cum parvo triangulo vel aliis lineis in quadrato, signum est infortunii magni.

84 Si in monte manus iuxta lineam vite prope receptam sit talis figura —, patricidium vel sacrilegium ostendit, et meretricem nequissimam.

85 Si linea semicircularis grossam in hoc loco reperiatur, pessimum cebitorem, male morigeratum, miserum et infelicem ostendit.

86 Si quedam figura composita ex lineis quibusdam glomeratis se scindetibus in hoc monte reperiatur, illud miseriam, tribulationem et debile cerebrum ostendit.

87 Si in quadrangulo manus circulus inueniatur, et non fuerit ibi triangulus, indicat perfectionem in moribus et scienciam. Quod si fuerit ibi triangulus, oppositum ostendit, quia triangulus ibi inimicos, angustias, tribulationes et inprospertatem ostendit, nisi sit alius triangulus sibi oppositus ita quod sit vnus triangulus supra comam alterius (245v) quia tunc honores et dignitates ostendit, ac etiam diuicias futuras.

90 Si in quadrangulo quoddam tale signum simile stelle appareat, iustum, legalem, veracissimum, verecundum et inculpabilem vitam ducentem ostendit, qui si pauper fuerit, ditabitur. Mulieres nimium diligit et forte ab eis ledetur. Hec figura in triangulo suspencionem signat. Si quedam linea fuerit in radice indicis, bene colorata et recta et per medium eius ostendatur vel prope, subtilem denotat eritque talis guerosus (generosus?) et animo magnus. Si autem ibi fuerint due linee non intercise, ille fortissimus est in compositione ad sui corpus. Et secundum alios vulneratus erit in inferioribus (in in floribus, in MS).

92-93 Signa voti incompleti. Si quedam pulchra crux linearum rectarum, bene coloratarum et continuarum, equalium vel prope, in quadrangulo reperiatur, illud complementum bonum et sanitatem vite, fidelitatem et bone conscientie hominem ostendit. Que si male colorata, curua, tortuosa et discontinua fuerit, contrarium insinuat.

94 Si ad radicem indicis extendatur hec linea a principio medie, linea exorta recte et bene colorata, diuicias signat in prima etate. Et si talis linea vadat ad digitum medium, diuicias in media etate. Si ad medicum vel auricularem, diuicias in ultima etate signat.

95 Si a mediana lineae procedant versus mensalem boni coloris, ille fidelitatem et bonam conscientiam signant, precipue si bene appareant.

Signum est cyromanticum quod si suis (suis in MS) manus habet pingues et rotundos

digitos tendentes in fine ad paruitatem vel acuitatem, debet esse pinguis naturaliter, et grossus ventre et carnosus in senectute, nec nisi studio aut labore compescerit corpus suum.

Digitos temperate magnitudinis et corpori bene proportionatos bone spei hominem et optime morigeratum ostendit. Digiiti breues latroni conueniunt. Digiiti longi et subtiles bonum ostendunt ingenium; parui digiti et tenues, stultum; parui digiti et crassi, audacem mundum ferum et latronem signant. Digiiti nimium tenues et prolixi stulticiam indicant. Digiiti coniuncti et coherentes immundum notant hominem. Digiiti non disperati paupertatem, leuitatem, loquacitatem et miseriam ostendunt. Extremitates digitorum grosse ruditatem ingenii signant. Qui habet multas lineas in omnibus digitis extra (*sic*) (246r) manum, ille inuidiosus erit.

Si supra dorsum indicis talis figura reperiatur —, luxuriam indicat et honorem prouenientem ex causa mulieris.

Si lineae arcuales in iunctura suprema pollicis ex parte vnguis cum aliis arcualibus infra digitum coniungantur et a nulla linea secantur, talem infallibiliter suspendendum iudicamus. Et si circa vel vltra iuncturam lineae archuales iungantur, submercionem indicant. Et si tales lineae sint archuales et non iungantur, fere erit talis submersus sed evadet, quia huiusmodi lineae periculum aque deostendunt.

Vngues longe, late, decenter splendide et subrubentes ingenium optimum absque dubio denotant. Hunc ergo sermonem de colore manus iudicamus. Vngues rubie calidam naturam ostendunt. Vngues oblonge et anguste stoliditatem et ferocitatem ostendunt. Inflexe autem et curte vel curue, ille impudentem, furem et furis condiciones indicant. Vngues impressi et multum incorporati stolidos signant. Vngues multum breues malignum signant. Vngues perrotundi in Venerem promptos demonstrant. Si puncta alba in vnguibus appareant, amicos et benedictiones signant. Nigra vero inimicos, persecuciones et maledicciones designant Vngues.

96 Signa vnguuium per se ipsa non sunt satis ydonea, verum aliis attributa habeant efficiaciam. Linea que soror trianguli appellatur, radix eius est dextra trianguli et per concavum manus vsque ad medianam lineam naturalem ostenditur et aliquando ad digitum Saturni porrigitur et a quibusdam Saturnia vocatur, que si ad digitum medium porrigatur circa multas res hominem sollicitum ostendit. Si autem sit lata, generabitur multis infirmitatibus.

97 Soror medie lineae, si pulchra sit, hereditatem venturam, et quanto pulchrior fuerit, tanto meliorem ostendit. Sciendum est quod si lineae naturales sint bone et sorores earum bone, duplicabitur earum bonitas. Si autem lineae principales sint male et sorores earum similiter male, duplicabitur earum malicia. Si vero generales lineae sint male et sorores bone, lineae principales habent diminuere sororum suarum bonitates.

99 Licet in dextra trianguli rami versus pollicem procedant vel eius montem et dictam lineam (246v) non centrent, diuicias et honores signant.

100 Si autem versus inferius procedant et circa medianam terminentur, dampnum, inopiam et deceptionem sustinebit. Que si\* ad medianam naturalem porrigantur transiuntes per triangulum, bone spei hominem designat sed in prima etate dampnum habiturum.

1 Si quedam lineae centrent dextram trianguli versus montem pollicis tendentes, dolores et labores signat.

2 Si dextra trianguli habeat (repeated in MS) crucem versus radicem manus et dividatur in fine per vnam lineam duas vek tres lineas, illud signat temperanciam et fine(m) vite bonam.

3 Si in linea dextra trianguli versus receptam manus sive in medio mediane sit vnus circulus vnum oculum signat amittere; si duos, ambos.

4-5 Si in fine dextre trianguli appropinquet medianam(?) hoc signum .p., diuicias et digni-

\* A space corresponding to 13 lines of text (si ad medianam . . . cum apertura versus) is left blank, presumably for a figure of a hand.

tates ostendit, cum apertura versus pollicem dirigitur. si autem versus ictum manus dicta apertura protenditur, dampnatur et infortunia signat. Manus cum breues sunt et inter medium semina(?) desuunt, malivolos homines signant aliensi malis gaudentes. Cum autem sunt ita proluxe quod cum extenduntur, erecto corpore cetero, genibus appropinqua(n)t, habiles operibus et fortitudinis sunt indices. Manus exigue et crasse, si digitos multum breues habent, tergiuersatorem, insidiosum et furem indicant. Manus tenues et intorte loquacem deostendunt et voracem.

Si linea vite, id est dextra trianguli iuxta receptam, manus crucem vel stellas habuerit, diuicias signat adquirere cum labore.

6 Si in pede huius lineae paruus triangulus fuerit, studere appetit et maxime vtilitatem et honorem. Hominem iustum pium ostendit.

7 Si multe lineae oriantur sursum a radice medici, signum est hominis amorosi.

8 Hec linea circularis signum est subiugacionis.

9 Si super vnguem pollicis fuerint puncta alba, illa amicitiam signant. Si nigra vel pallida, est signum crudelitatis.

Cruces exorte a dextra trianguli a parte trianguli circa medium signa sunt bone fortune et honestatis.

12 Si basis trianguli scindatur per vnam lineam per concauum manus transiuntem, signum est proxime infirmitatis et doloris vicine.

11 Si multe lineae in triangulo fuerint, (247r) hominem colericum signant inclinatum ad homicidium, latrocinium, ad insidis(?) et dolos.

13 Si talis figura .0. reperiatur in dorso pollicis, talis submergetur vel strangulatur vel saltem multa mala sustinebit.

14 Hec signa in auriculari ff. furem et latronem designant.

15 Si quedam lineae fuerint in radice auricularis tendentes versus montem manus, mendaces et inordinatos, fures et insidiatores signant tam in viris quam in mulieribus.

Nota quod linea mensalis a quibusdam vocatur abrupticon, illud eo quod sepius abrum-pitur. Et dextra trianguli dicitur ababrupticon quia non potest corrumpi.

Si recepta manus recta sit et continua, signat in habente magis in propriis negotiis quam alienis esse sollicitum. Si autem tortuosa et discontinua (disconciam in MS), contrarium signat.

Si in radice medii digiti vel indicis, sive in secunda iunctura eorum, sive circa spacia media vel interius sit aliquis nodus carneus vel pellis superfluitas, laborem inordinatum sensit et continuum et aduersitatem circa opera sua.

16 Si in pulpa auricularis extra iuncturas apparuerit linea aliqua obliqua, submersionem signat in aqua aut periculum in puericia.

17 Et si dicta linea sit in medico, in adolescentia. Si in medio, in media etate; si in indice, in senectute; si in pollice, in senio euenire ostendit.

Mulier habens manus rubeas libidinosa indicatur et quod cum multis viris fornicari cupit naturaliter.

Si supra medici vnguem sint puncta alba, illud secretum amorem in habente ostendit. Si autem fuerint nigra, illa magnam iracundiam significant et austeritatem.

Nota quod quando circa in carne existent radices in cute pendentes, iram et inuidiam ostendit, et sepe habentem significant inimicos habere. (247v)

Cyromancie requiritur in agnitione lune cognicio. Quia lune proprietas est, et astronomi ponunt et naturales, super humida dominari, ut Aristoteles in libro elementorum et Ptholomeus in Almagesti et Alfraganus et ysaac in anticodario (antidotario?) et Rasis in uno corpore de 8 corporibus et ysidorus in libro ethicis et examinatori dicunt quod ministra et domina humiditatis est, ideo dominatur super medullam in ossibus et suctum in plantis et secundum suam augmentationem sibi similia augentur scilicet humida et ad defectum deficiunt et diminuntur.

Et cum manus, que est subiectum huius scientie, sit corpus quod nutritur humoribus et unitur sanguine, illud ideo oportet cum sanguis augetur et rubedo et color manuum intenditur. Et sanguis sit humidus ut subiciatur ut dictum est. Sequitur enim quod in



lune augmento sanguis augetur et rubedo et color manuum intenditur. Et econtrarium in defectu lune. Et ideo pro arte ista primo est cognoscendum cuius status est luna. Que si in defectu fuerit, facias tunc lavari manus aqua tepida et postea mundari. Et si lineae tunc fuerint albe, non iudices quia signum est reconditum quo ad uitam, quo recondito certum iudicium dare non poteris propter siccitatem venarum. Si autem lineae fuerint rubee post lot cionem in corpore satis fidelem iudicabis. Si vero fuerit dies dominica et luna monoydes idest in augmento manibus lotis et mundatis de lineis accidentalibus, satis leviter iudicare poteris, quia sol diei predominans tunc facit sanguinem habundare.

Si autem luna fuerit dyathomos et paciens defectum in eius die, idest in secunda feria, facias manus lavari aqua calida, deinde tergas manus fortiter et cito post respice eas et sic in pluribus erunt certa. Si vero fuerint afficietes in 3a 4a et 5a feria manibus lotis ut dictum est potes bene iudicare nisi manus fuerint grosse, vile(?), et rugose, quia tunc signa deficiunt.

Si autem fuerint luna pansalenos idest plenum et dies Veneris vel Saturni, manibus lotis, ut dictum est, certe iudicabis.

Cyromancia est ars denominans mores et inclinationes naturales per signa sensibilia et materialia. Mores autem comuniter sunt isti: Gaudium, tristitia, Amor, Odium, largitas, auaricia, Sanitas, Egritudo, Fortunium, Infortunium, Addiscon(?), Fatuitas, temperancia, Intemperancia, paciencia, impaciencia, Renigrams(?), Iracundia, pusillanimitas, Audacia, Subtilitas, ebetudo, constantia, Inconstancia, Sompnus, vigilia et hiis similia que ad hominem inclinationes pertinent. quoniam de istis homo indagare potest per signa sensibilia que sunt ista: Spissitudo manuum, Quantitas, Tenuitas, Sudor sive humiditas, Siccitas, (248r) color, asperitas, Lenitas, palliditas, et huiusmodi. Ista ergo sunt signa naturalia et ideo ista ars non intromittit se de illis, que signa naturalia non ostendunt .s. (sed?) de mecanicis et aliorum similium.

Dividitur autem cyromancie subiectum quod est manus in 5 partes, scilicet in montem, foueam, planiciem, mensam et maximam mensem et in latera planicie. Mons est illa grossa pars que sub pollice iacet et iungetur triangulo ex una parte. Fouea est infra triangulum que iungitur inferiori parte planicie. Planicies est illa parva que extendit se in linea mensali vsque ad manus iuncturam que est prope partem digiti auricularis. Mensa est illa pars que iacet inter lineam mensalem et triangulum. Maxima autem mensa est illa pars que maxime se extendit sub 4 digitis per digitorum montes. Latera planicie extendunt se vsque ad partem exteriorem manus.

Secundum Alfraganum manus dividitur in 2 partes, concauitatem scilicet et convexitatem. Concauitas est per tres partes .g. per principium manus quod (quos in MS) est os brachii et dicitur radix manus. Et secunda est palma sive manus planicies inter omnes digitorum montes situata. Tertia pars est 5 digitorum montes quorum taliter correspondet vnus digitus. Primus digitus est pollex duos tantum articulos habens. Similiter autem aliorum 4 scilicet index medius medicus et auricularis 3 habet articulos. Et quia secundum artem cyromancie plures habentur partes in quibus signa naturalia situantur quibus hominis hominem in MS) passiones et infortuna indicantur, ideo huius artis sectatores presentes in illo deficiunt.

Sed quia manus, ut dictum est, in plures partes dividitur quantitativas et in partes multiplices, qualitativas quarum alie lineae occitantur, ideo notandum est quod linearum quedam sunt essenciales, quedam autem accidentales. Essenciales autem sunt quatuor, scilicet 3 triangulum continentes et quarta mensalis que per cyros et mensas extenditur. Item essentialium quedam sunt recte, quedam oblique, quedam oblique colorate, quedam pallide, alie scisse, et alie continue. Primo autem dicte sunt essenciales quia in qualibet manu reperiri debent. Et si aliqua defecerit, (248v) est defectus nature. Et si inserte est signum maxime bonitatis.

Si deficit basis trianguli, signum est infidelitatis et inconstancie. Si vero deficit linea mediana, infortunia et mala in ultima etate sibi veniencia signantur per ipsum, commissa in media etate difficiantur(?). Si autem deficiat mensalis, infortun et mala in vltima etate

sibi veniencia signantur. Si linea vero in pollicis monte deficiat in prima etate, similia ostenduntur. Et ideo secundum dictarum linearum absencias vel presencias iudicia dicta sunt danda.

Accidentales linee sunt ille que est (*sic*) in calore, frigiditate, siccitate, humiditate sive sanguinis defectu ac laboribus generantur. Tales autem fallunt iudicem. Sed essentielles sunt naturales et signa pronosticantur naturalia que ex natura manifeste situantur.

Istarum essentialium sunt 4, prima et principalis que linea vite appellatur sub pollice situatur, quia sicut vita est hominis presentis (?) perfectio similiter se clausa rationalitatis ideo linea vite in principali parte manus est situata que est pollex cum suo monte et capit initium suum vel saltem capere debet a medio spacio inter pollicem et indicem et finitur versus receptam manus.

Alia dicitur media naturalis que etiam in pluribus in eodem spacio incipit et palmam secat per medium. Vnde linea vite dicitur dextra trianguli, pro media linea dicitur sinistra trianguli. Tercia verso est basis trianguli. Quarta quoque est inter lineam mediam et digitos que dicitur vltima naturalis seu mensalis. Et secundum hanc divisionem partes palme dividunt. Nota autem quod illud quod in medio trianguli continetur dicitur concavitas palme et pars inter mediam lineam et mensalem dicitur mensa.

Cuilibet etiam digito vnus mons correspondet qui a suo digito denominationem habet ut a pollice illud mons pollicis.

Pars palme que incipit ab auriculari desinens versus brachium ictus sive linea incisionis nominatur. Et pars ibidem supereminens mons incisionis dicitur et vsque ad basim trianguli continuatur. Hec autem dicta sunt ut partes manus cognoscuntur per quas signa iudiciaque (indicis que in MS) sumantur.

Postquam dictum est de subiecto et eius divisione (diccione in MS) dicendum quomodo in hac arte erit procedendum. Et primo sit notandum quod in ista scientia naturali oportet speculari quod eius iudicia non (249r) sint absoluta sed cum deliberacione studiosissima ut in eius iudiciis non sit contradiccio, quia talia sunt fantastica, sed pro quolibet iudicio naturalis ratio sit practica, et si signa discordant in dextra, requiratur in sinistra.

Et phisonomie iudicium non obliviscatur, si fuerit sibi conforme, et tunc secure iudicabis et ad eius intellectum vel complexionem commixiones in memoria sint notande quia plurium testium radicatus in quacumque facultate est iudicium. credite digito sibi participante simpliciter illius principiis seu commixtionibus deducendis deducuntur.

Sed quia inter omnia circa que in ista arte versantur iudicia sunt quatuor linee naturales, ideo de illis primo in presenti mea speculatione tractare propono, deinde de aliis signis manuum secundum naturalem indagationem mea debilitas ingenii naturaliter me in ista arte speculante compellit.

Dixi primo quod de 4 essentialibus et naturalibus lineis primo propono pertractare. Et primo de prima linea que est linea vite circa quam iudicium spectabilius consistit. Ideo sit ista ratio generalis. Si linea vite se extendat versus receptam ad manus iuncturam cum brachio, signum est longe vite. et quanto abbreviatur, tanto minorem ostendit abbreviacionem vite. Et in ista linea debes considerare 3 proportionales partes et illas 3 etatibus comparabis ymaginarias et iuxta partem que incipit a monte pollicis si fuerit discontinua signat quod in prima etate erit infortunatus et sic de 2a.

Sed est sciendum quod in prima fortune deducuntur iudicialia scilicet si bona diarriculacio et profunda fixio et debita continuacio colore non deficiente, vite longitudinem signat.

Seclusa magna sive rubedine intensa vel palliditate linearum essentialium omnium vel saltem duarum scilicet vite pronosticat quia bona diarriculacio linearum quam fixio ex bona parte(?) procedit interiori naturali dispositione que causa est vite diuturne.

Et si uniformis fuerit et secundum receptaculum manus, illud sanativum bene dispositivum audacem et constantem designat.

Et hoc idem iudicium est de aliis lineis essentialibus.

Quia omnis talis linea bene continuata, non nimis lata, bene fixa et competenter colorata

illud subtilitatem, fidelitatem et bonum consilium signat, quia secuntur colericam et sanguineam complexionem.

Si autem linea vite versus radicem manus crucem habeat, ita quod dividitur finis eius per (249v) vnam vel dua sive plures, signat temperanciam et finem vite bonum.

Si vero versus medianam truncata fuerit, peruersitatem, dolos et luxuriam signat, hoc idem si brevis(?) fuerit.

Si tamen, si habuerit in principio multas plicas perici . . . tes, consilii designat mutationem.

Et in principio ubi appropinquit medie, si talis figura invenitur 7 (?), augmentum divitiarum signat et gradum dignitatis ostendit, si eius apertura versus pollicem ostenditur.

Si vero versus acumen digitorum montium, infortunium et dampna denotat.

Si autem lineam vite multe linee in concavum sint scindentes et rubeae, impacientiam signant.

Si autem grana rubea sita irregulariter habeat, contencionsum, signat et luxuriosum et propter operationes consimiles sanguinis effusionem membrorum suorum et aliorum procurabit.

Et si talia signa situantur versus pollicis montem, oppositum ostendit.

Si in eadem linea reperitur tale signum O, secundum linee divisionem ut dictum est in eadem etate oculi amissionem indicat. Et si 2, amissionem duorum.

Si autem in eadem linea reperiantur 3 linee versus pollicem et una linea per eas transit, dicitur ab aliquibus quod est signum lepre vel morphee et diurne infirmitatis abhominabilis.

Quando linea vite est maius grossa et profunda et terrestris coloris, ruditatem designat. Et si color eius fuerit multum rubeus cum grossitudine versus manus receptaculum, iram et dolorem capitis denota.

*LINEA MEDIANA* quando est recta cum montibus bone altitudinis, satis profunda et boni coloris, bonum dispositionem complexionis, ingenii subtilitatem et fidelitatem portendit. Et quando est bene articulata et profunda et bene apparens protensa vsque ad montem incisionis, longam signat vitam. Et si pertransit totum manum, vitam brevem denotat. Et quando linea ipsam secat ad modum crucis versus finem, mortem proximum ostendit et infra annum imminuentem.

Et si nimis grossa fuerit dicta linea, illud ruditatem ostendit et indiscrecionem.

Et si protensa fuerit et tenebrosa et tortuosa, robur, fortitudinem, iram et conturbacionem signat pro re facta vel facienda.

Et si manus fuerit subtilis et recta, boni coloris, leticiam signat.

Si autem pallida aliquantulum, illud debilitatem complexionis designat.

Et quando brevis et discontinua, mutabilitatem et levitatem ostendit cum verborum inconstancia.

Cum autem fossas in medio eius videris et in ambabus manibus rubeas non equales, non est grata persona nec reuerencia hec digna.

Si linea media torta fuerit et discontinua, gracilis et profunda, coloribus variis variata (250r) et per medium scissa, latrocinium et dolores signat. Et si linee a concavo manus procedentes illam intersecant, ille dominum suum falsificabit per litteram, pecuniam vel sigillum.

Et si linee ab ipsa procedant versus mensalem bene apparentes et boni coloris, virtutem felicitatem bonam constantiam et promissorum fidelitatem ostendit.

Et idem signat crux inventa inter mensalem et mediam, precipue si crucis anguli sint recti, quia si acuti vel obtusi, deficit.

Et si in linea media exierit linea scindens mensalem versus digitum auricularem vel medicinalem (*sic*), ostendit quod ratio dominatur parti sensuali et quod sit continens et pectare erubescit.

Et si parvus circulus fuerit in fine manus, gratia exempli appetitum addiscendi et honestatem ostendit.

Et si dicta linea versus concavum manus copularetur et haberet lineas supra extendentes, signat inconstantem et mendacem, et in mulieres illud non castam.

Si autem bonam habeat fiuram (fixuram in MS) et cognitam(?) latitudinem et claram cum rubedine mixtam palme aptam et puncta puta ad modum granorum rubea, signum est audacis et amoris atque laudis et quod bonam habet gratiam.

Et si nimis grossa fuerit pallida discontinua et rugata, debilitatem corporis et capitis egritudinem portendit.

Et si per fricationem cito rubescit, egritudinem corporis cum debilitate signat et in temporibus ex renente(?) ostendit.

Et si puncta profunda habuerit, oculorum infirmitatem notax.

Et si talis inna parte fuerit rubea et in alia non, illud capitis dolorem ostendit.

Et si male colorata et figura (fig 9 in MS) diversificata variis lineis, diversas denotat et abhominales et mutaciones in corpore ad temporis mutaciones.

Et si rugosa et grossa puncta nigra habuerit, ebrietatem ostendit.

Si linea pallida sit et puncta rubea, bene apprehendit, deficiet in iudicio.

Si autem crucem inter mensalem et mediam habuerit sub medico, peregrinaciones et labores habebit causa honoris et amoris et donocionis illius vel alterius utilitatis.

Basis trianguli in multis manibus non invenitur et singulariter in iuventute et patet in senectute, sed ubi deficit iudicandum est ut prius. Unde in colericis aliquibus propter excessum caliditatis et cutis subtilitatem que (quod?) eedem commune (MS Col), linee non sunt vise aliquando. Sed tunc colerice complexionis sunt indices viz corporis (250 v) agilitas, cito irasci, cito loqui, leviter amare, vina forcia et cibos calidos frequenter appetere.

Sed tamen manus carens hac linea, si debilis et mollis fuerit, frigiditatem et fleumam signat et consimiliter defectum digestionis et gravitatem expulsionis denotat.

Si autem hec linea appareat fixa, profunda et debite colorata, sanitatem epatis et bonam dispositionem leticie et audaciam signat. Si de opposito, oppositum iudicamus.

Si fuerit hec linea a pluribus lineis pallidis interseca, malam digestionem signat et calores epaticos varios denotat.

Et si ex illa procedant puncta et sint in ea, illud ventris duriciem vel costarum maliciam ostendit.

Quando autem versus lineam vite rubet, dolorem capitis ac destructionem stomaci vel epatis signat.

Si autem rubeat versus medicinam et ibi sit subtilis cutis et linea, siccitatem et veloces febres sive propinquas sive dispositionem ad ethicam. Unde tamen macilenta manus calida et sicca denotat.

Quando autem parvi noduli ad modum cicatricis secant dictam basim in medio, signat egritudinem et si rubea fuerit, egritudinem calidam.

Et quanto antiquatur, tanto magis infirmitas antiquior.

Erat est notandum quod egritudo designata per lineam vite a corde pulmone vel diaphragmate trahit originem, per medianam a capite vel a cerebro, per basim, illud ab epate vel stomaco, quia hec principalia membra per dictas lineas designantur.

**ANGULUS SINISTER.** Si rectus fuerit vel acutus, signum est longe vite et bonitatis ingenii sed asta eius est acutum quamvis deficiat in valore. Et si obtusus fuerit, idem est iudicium quod est de obtuso dextro. Et si basis vsque ad angulum sinistrum immediate alligatur, idem est iudicium de significatione trianguli et angulorum eius. Et primo de angulo superiori que continetur in basi a dextra parte sive a dextra linea. Angulus, sinister est qui integratur a sinistra parte basis et isti dicuntur inferiores. Unde ratio est, Quicunque triangulus est equalis vel prope, illud sanitatem et prosperitatem ostendit, maxime si linee constituentes fuerint bene apparentes angulate et competenter colorate, tunc etenim naturam interiorem bonam pronosticant.

Si triangulus satis sit largus, largitatem signat.

Et si spatium planium boni coloris fuerit, siccitatem signat. Et de opposito oppositum.

Et si spacium erugosum sit, illud siccitatem signat.

Et si male coloratum, illud dolorem capitis ex grossa materia vel frigore ostendit.

Contingit aliquando quod linea dextra et sinistra angulum constituunt in concauo manus (251r) et eciam spatium trianguli est strictum et tunc signat miseriam auariciam et angustiam propter substantiam acquirendum. Et de opposito, oppositum.

Et aliquando omnes ille linee obviant inter digitos et si sint decise sive ramiculate, illud ingenium bonum, constanciam, prouidenciam et huiusmodi ostendunt.

Et si lineae sint nimis subtiles in extremitatibus, prodigalitem vel largitatem propter inanem gloriam demonstrant.

Et si dextra per sinistram transit ubi debet esse angulus, penitet facte largitatis.

Et si ibi inveniatur crux, illud tedium, inuidiam, detraciones et oppressiones ostendit.

Et si rupcio contactus anguli sit subtilitas cum rugis et virgis augmentem promotionem graeciam inter conuersantes, amorem, pulcritudinem vestium et mulierum senatus, cantus musicorum designat. Et si aliter dicunt, incontinenaiam.

**ANGULUS DEXTER** aut est rectus aut obtusus aut acutus. Si rectus bene apparens sine aliarum commixtione linearum, bonitatem signat sanguinis, cordis, spirituum vit-alium et digestionis discrepacionem et bonam conuersacionem signat cum largitate. Si acutus, eadem que rectus sed non tantum largitatem sed magnam curialitatem.

Angulus autem obtusus malam dispositionem, non debitam discrecionem, rudem conuersationem, ineptum, sompolentum et negligentem signat.

Et si lineae non tangunt se mutuo et angulum constituent, mutabilis est et non sane conscientie mechator\*(?) nec bonum habet dispositionem sicut ille qui rectum habet vel acutum. Hii dicunt aliqui opinantes quod si in hoc angulo sit talis figura superius erecta rubea, illud rectam filiorum propagationem. Et si inferius apertam hoc modo filiarum. Et idem iudicium est dandum de mulieribus quam de masculis.

**DE SORORIBUS PRINCIPALIU**. Quando invenitur linea incipiens iuxta initium basis trianguli vel prop, stans ante lineam versus digitum indicem et mediam secans et lineam mensalem illud de diiudica sicut de linea vite, si appareat. Et si appareat, forcius est iudicium.

Circa basim invenitur una linea que soror basis vel sodalis dicitur, et hic metur(?) de media et messali. Tamen aliquando contingit quod una impedit significationem alterius sive in bono seu in malo, tamen principaliter tenendum est iudicium, quia sorores sunt accidentales. Dicitur etiam ab aliquibus (251v) quod si alia linea altissime vel eius loco procedit vsque ad medium vel ad alium transiens per medium digitum non inter digitos, talis linea dicitur honoris. Et si transit ad indicem, honorem regis. Si ad medium, honorem scientie discrete. Et si ad medicum, honorem nature. Si autem ad auricularem, honorem generis vel fortissime.

**DE LINEIS INFRA TRIANGULUM SEQUITUR CAPITULUM**. Quandoque a linea vite oritur linea tendens versus angulum sinistrum vel versus brachium et signat periculum in aqua vel per ignem in se vel in suis rebus. Et si est subtilis vel pallida, illud est preteritum; si grossa et rubea, futurum. Et hoc tene securum versus triangulum superiorem cedat. Et nota quod discontinuatio et decisio per lineas et eciam diversificationes impediunt linearum significaciones sive in bono sive in malo. Secundum autem antioquos dicitur quod si linea dicta tendat versus superius principaliter ignis est signum. Si vero inferius, tam ignis quam in aqua. Item si ab ora manus versus montem visionis oriuntur lineae (linso in MS) ad modum flammularum, signant periculum ignis. Et si infra triangulum appareat figura ista 0-0 iuncta, signat quod ira commotus occidet socium suum vel alium sui loco. Et si puncta rubea, 0-0 abortum signat procurantem. Et si in manu mulieris, est signum quod est pregnans. Si crux in triangulo quod in medio reperitur, deuocionem et diligenciam signat. Et si supra circa angulum superiorem, furiam denotat. Omnes lineae subtiles capillares scindentes trianguli basim, quarum alie ad extra, alie ad intra procedunt molestias ey falsitates ostendunt. Et si multa lineamenta (linamenta in

\* Not in Du Cange or the *Medieval Latin Word-List*, Oxford, 1934.

MS) ibi vel alibi apparent, illud debilem complexionem et femineam, parvitatem caloris et virtutis ostendit, et talis cito permutacionem recipit et est passibilis valde.

DE MENSALI. Linea mensalis. Si sit equalis, continua, minus profunda et longa sine diuisione ad longitudinem medii naturalis vel vsque ad montem medii, et eque distans et competenter colorata, denotat bonam significationem linearum principalium et trianguli, et de se eciam bonam complexionem sanitatemque in ventre et renibus et membris generativis, tam in viro quam in muliere, et significat iusticiam et continenciam quantum est de natura sua vel secundum naturalia. Fforet autem propter instanciam aliorum et variam nutricionem et societatem potest aliter euenire. Si tamen ueniat versus palme finem, videlicet circa indicem, iracundie et nequicie signum est. Et si ad lineam vite veniat et cum ea angulum constituat, inclusam (*sic*) in natura eiusdem indicii est et ultra addit quod affectat utilitatem propriam et honorem, et est adulator et sufurrotor.\* Et si procedat versus indicem ad eum declinando viuiter recipiendo eius latitudinem, honorem ostendit et quanto plus, tanto maiorem honorem. (252r)

Et si descendat uersus medium, Illud honor remittitur.

Et si talis circa indicem vel medium bifurcata fuerit, zelatorem conscientie et rerum spiritualium sive ecclesiasticarum ostendit.

Si vero ascendat versus indicem, laborem et fluxum sanguinis vel inferiores partes alterius materie ostendit.

Si autem talis linea est grossa, lata et profunda et rubea, illud potentem in membris generativis signat.

Et si lineae (linea in MS) ad modum rami supra et infra oriuntur ex ea, in tantum tamen (in MS) potens est ad luxuriam et debet delectari in eius actibus sive interioribus sive exterioribus.

Et si plura puncta inuenias rubea, et linea sit profunda et quociens fuerit in infirmitatibus variis, vexabitur in suis membris propter materie excessum.

Et est notandum quod signum in manu mulieris non debet esse ita profundum nec coloratum nec tante apparencie sicut in manu viri propter debilitatem caloris naturalis, et ideo pauciora signat in manu mulieris quam in manu viri.

Et si homo habeat lineas tenues et subtiles et manus pallidas, signum est quod deficit in calore et quasi femineus est in virtute naturali et est invidus, detractor, cupidus et verbosus; nec indicatur securus cum eo habitare, sed in muliere est omnino dyalectica persuasionem seclusa.

Si linea mensalis fuerit rubea, satis lata, discontinua, a pluribus lineis secta, impotenciam in membris signat generativis. Si autem pallida et granata fuerit et punctuata, debilitatem caloris naturalis signat. Et si alicubi rubea et alibi pallida, dolorem ostendit in intestinis vel membris inferioribus.

Sed hic nota quod si palma fuerit extensa, et linea fuerit Regularis(?) et recta et si sub digito medio foueam contineat, studiosum signat et honorem et amorem religiosorum et secretarum personarum et ecclesiasticarum ostendit.

Si sub medico et auriculari fuerint lineae et puncta parua rubea, infirmitatis dispositionem signat in renibus. Si autem fuerint pallida, in vesica.

Expedita speculatione linearum naturalium iam de montibus dicamus circumvallantibus. Et primo de monte indicis. Si inter primum montem (meneum in MS) et radicem indicis plures lineae inueniantur, transeuntem promissorum ostendit. Et si secte omnium(?) eque distantes a mediana et satis apparentes non secte per aliquas lineas, tunc fidelitate(m) promissorum ostendit.\* Et si linea fuerit longa versus concavitatem vel convexitatem, detrahit locum illum in alia significatione.

Si crux in monte indicis reperiatur, honorem ostendit.

\* Not in Du Cange or Medieval Latin World-List, Oxford, 1934, but evidently means a sneak-thief; from the verb *suffuror*, see Plautus, *Truc.* 2, 7, 15.

\* The MS repeats "Et si secte Omnium."

Si .9. in montibus medi et indicis (montes medio indicis in MS) fuerit, nobilitatem prime generis et morem at ad honorem magnum (252v) venturum ostendit.

Si in ictum (Icictum in MS).  $\oplus \nabla$ . hoc, illud signat predictum. Si a mensali per predictum montem due linee transeunt profunde ad angulum superiore, illud infirmitatem magnam ostendit. Et si subtiles, non tantam, sed secundum alios, si rubie, futuram; si pallide, preteritus. Et si in eodem loco figura fuerit talis .z., egritudinem signat.

Si plures linee per dictum montem transeant, ille turbacionem capitis et cerebri ostendunt. Si sint pallide et subtiles, quia iste mons capiti deseruit.

Si linea mensalis vsque ad indicem veniat cum divisione, illud signum est probitatis et audacie. Et dicunt aliqui quod in fine huius linee alique se intersecant, quod est signum vulneris ab inimicis. Et si grosse fuerit, illud in capite; si subtiles, in tibiis; et si rubee, in pectore. Si autem procedit a linee mensalis fine ad indice(m) et transit per mediam versus medii montem, illud dicitur quod per vulnera morietur. Si vero a fine mensalis oriuntur duo linee vel tres directe ad indicem tendentes, radicem indicis intuentes, subito morietur. Et si torte, illus illius capitis et colli vulnera ostendit. Et si grosse, rubee, colorate, febres futuras. Et si subtiles, transactas.

Hec linea mensalis transiens inter indicem et medium, ut dicitur, sanguinis fluxum vel parcium inferiorum ostendit. Si circa montem vel de illo (ille in MS), morietur. Et si multum acuitur mensalis versus montem indicis, acutas febres signat. Et si multe linee versus finem sui procedant, guttam vel paralyzim ostendunt.

DE MONTE MEDII. Si soror line vite et basis transeant per medium equaliter et bene disposita per mensalem versus medii montem, curiositatem et in agendis negotiis fortunatum signant. Et si non fuerit continua, ille in suis negociis erit infortunatus. Si linea processerit a mensali profunda recte vsque ad medium seu prope montem, illud magnam curam et laborem pro sua vita ostendit. Et si plures, intensius est iudicium. Et si linee sint subtiles, ille non multum curat de negociis, quia remissius. Et si tales linee secentur, in laboribus suis impediatur. Si mons iste reperitur cum lineis, illud quietem vel ociositates ostendit. Et si appareant hee profunde et cui secundum eius iudicium laboris eius intensiorem vel remissionem ostendunt. Item si vna vel plures transeunt per montem transeuntes sub medio, illud naturam(?) signat et bonam vitam. Si radix medii articuli(?) per duas lineas dividitur, infirmitatem pronosticat. Si profunde fuerint, futuram. Si subtiles, preteritam. Item cancellate inter medium et medicum sine cruce indiscrecionis signat; ostendit maxime, si sint breves.

(253r) DE MONTE MEDICI ponuntur hee Regule. Si due linee recte eque distantes bene a mensali fuerint tendentes ad radicem eius vel prope, illud ingenii subtilitatem et scientie euidentiam, artis arroganciam loquacem, et scians, loquaces diligentem ostendit, quia tales cupiunt plus apparere quam esse et honores nouos habere, infamiam cum mulieribus ostendit. Et nota quod ille due linee predictae vel plures honores et dignitates signa(n)t temporales vel ecclesiasticas. Et si linee transeuntes scindunt, iudicium eius sublatum est. Et si ponuntur transeuntes et non scindunt lineam, inimicorum impedimenta signat, sed non preuelebunt. Et si dicte linee appareant discontinue, scilicet quod non simul incipiant, illud signat quod honore habito deficiunt. Et si vna recta vel plures, subtilitatem in mechanicis et dileccionis intentionem ostendunt.

Et si in radice medici fuerint linee grosse rubee, vulnera in femore. Item nota quod linea grossa, bene colorata, altitudinem status et bene renunciata(?) ostendit.

DE MONTE AURICULARI. Primo ponitur hec regula. Si a mensali aliqua linea processerit versus radicem auricularis et fuerit recta et alba, non colorata, in viro secretum et avariciam ostendit. Et de muliere virginitatem et castitatem. Et de opposito, oppositum. Item si plures linee in monte auricularis appareant in homine, dilectos ostendunt. Et in muliere, ille leticiam et risum signant. Et si tales scinduntur, impediuntur iudicia.

Et si in articulo eius sint linee scindentes rubie, ille in genibus certa volnera ostendunt. Si autem a mensali incipiant et scindant articulum in brachio vel in manibus.

Hic nota quod si linea transversa ad medicum ab auriculari procedit, mutacionem vite

signat. Et si inter mensalem et radicem digiti predicti transeuntes sint linee, nupcias cum summo gaudio signant. Si autem scinduntur, mutatur iudicium.

DE MONTE ICTUS p<sup>a</sup> 30<sup>a</sup>. Cum in isto sub mensali sint line(e) transeuntes recte, eque distantes, bene colorate, continue non secte, bonam signant nonestatem et multos habere amicos. Et si sint appropinquantes linee mensali, signat amicos extraneos, et quantum plus, tantum magis extraneos et tamen eius fortunam. Et si linee descendant versus receptaculum signat amicos compatriotas, et quanto plus, tanto magis. Et si tales linee adinuicem complectuntur (253v) vel adhereant, collectionem signat amicorum. Et si se erigunt versus superius et sint linee auriculate et eque distantes, promptos inueniet amicos ad eius auxilium potentes. Et si descendant versus brachium, ostendunt amicos si possunt vel sciunt. Sed aliqui dicunt quod erit imperimentum propter negligenciam amicorum. Et si tales procedunt a sinistris versus mensalem, inimicos signat, et quantum plures, tantum plures inimicos. Iudicia tamen predicta debent considerari secundum intentionem et premissionem linearum. Et si linee iste appareant non equales, sinistrum est iudicium.

DE MONTE INCISIONIS dicamus ad cuius situacionis euidentiam oportet ymaginare lineam per medianam ductam esse vsque ad incisionem manus et a mediana(?) vsque ad mensalem et tunc ita in duo dividitur scilicet in parte que situatur inter mensalem et medianam et a medio vsque ad radicem manus. Si in parte a mediana ad mensalem sint due linee vel una et non bene disposita, exaltacionem cognacionis ostendit ad verecundiam. Et directe et bene colorate, ille honorem et rationem signant, et hoc idem signat + ibidem posita. Et si ibidem est magnum linamen(tum), in defectum vigoris naturalis signat, quia est signum fleumatice complexionis. Et si mediana se extendit vltra montem et alia ad modum crucis eam secat .g. in fine, illud debilem naturam et vitam breuem ostendit. Si sint multe linee in parte huius montis inferiori, scilicet a mediana ad radicem manus capillares et transuerse, flemam ostendunt ostendunt et frigiditatem et fluxum et infirmitates epaticas. Et hee infirmitates cognoscuntur per lineam longam que oritur supra basim procedens super angulum sinistrum. Et si fuerit satis rubea, futura. Si pallida, preterita vel dispositio ad tempus longum infirmitatis futurum. Et nota secundum alios quod si situantur in tabula manus a latere, quot fuerint linee, ille tot uxores habebit, si laicus fuerit. Si vero alterius condicionis, honores, status et gradus signant(ur).

DE LINEIS IN POLLICE. Si plures linee grosse, bene apparentes et bene colorate fuerint in eo situate, illud indicabit bonam fortunam in acquirendis amicis et diuiciis. Et si sint plures linee 3 vel 4 incidentes, aliam vite continuantes vsque ad radicem pollicis, diuicias in iuventute et durantes vsque ad senectutem, et quanto longiores et grossiores, tantum plus de fortuna. Et grosse circa radicem in iuventute; si circa medium, in media etate; si autem circa lineam vite, in ultima etate.

Et carencia istarum linearum carenciam amicorum ostendit et diuiciarum; vel si habebit, deficient. Et si iste linee scinduntur, amicorum et diuiciarum et laborum tedia signat; et tribulaciones, mociones et violencias per invidiam ostendit. Et quantum plus, tanto intentiores et iudicia maiora signat. Item quando linea vel linee a radice pollicis (254r) se extendunt ad lineam vite et non pertransiunt per illam et sunt bene articulate (articulare in MS), bonam vitam et longam signant. Et si impediuntur, labores magnos ostendunt. Si vero se extendunt versus angulum superiorem, cogitaciones et desideria quietis et deliciarum sive diuiciarum ostendit. Et si ibi sit, extra laborem. Et si ab angulo superiori linee se ostendant versus montem, scilicet(?) ad montem linee vite et articularem late, luxuriosum demonstrant et vili modo. Et si tales apparuerunt in monte, illud diuturnam ostendit egritudinem. Et si talia signa, V. Λ. V. Λ., amissionem amoris et honoris signant.

Si a radice pollicis linee extendantur et transiunt versus superius, magnas tribulaciones deostendunt per aliquos de parentela propter inuidiam. Item si linee extenduntur a radice pollicis, quarum vna versus partem interiorem et alia versus exteriorem procedit, tedium magnum pro parentibus et amicis ostendit. Et si supra primum articulum pollicis est linea circularis, uxorem ostendit. Et quot tales, tot uxores. Et si grossa fuerit, viduam. Si gracilis et subtilis, puellam.

Et si in primo (principio in MS) articulo vel 2<sup>o</sup> inueniatur linea circumdans totum digi-



tum, signum est suspensionis, non honoris vel beneficii, et est signum infidelitatis. Et si linea scindit per illam, est optimum iudicandum. Et si ex opposito circa per (?) caput reperitur tale signum, 2 vel 4, est signum lepre et odiosi hominis. Et si circa vnguem reperitur tale signum .0., ostendit quod erit submersus. Et si supra iuncturam, turpi et vili morte morietur, quicumque est ille.

INCIPIT HIC DE ALIIS QUATUOR signorum (signum in MS) manuum per que cognoscendum est mores et inclinaciones hominis naturales que sunt ista: quantitas, vnguis, cutis, pili. De quantitate Aristoteles in secretis secretorum dicit Alexandro, Cum brachium cum palma extensum ad genu vel circa 4 digitos pervenit(?), largitatem, abilitatem corporis et potestatem, supposita proporcione aliorum membrorum cum debita etate designant.

Et secundum Albertum, Si brevis est quantitas sic quod multum a genu distat, ignorans est et discordiam diligit et gaudebit de malo alterius. Et si brachia sint, brevia sunt.

Item Aristoteles: Palme longa cum digitorum extensione, bonam dispositionem et subtilitatem arcium ostendit et singulariter in arte mechanicorum. Que de opposita ostendit oppositum.

Si palma magna et digiti breues, fictum, insidiatorem non fidelem ostendit et grossi non circumspexerunt sed simplex et iudicio substantialis, et si tota manus lenta et macra fuerit, magnam fortitudinem signat.

(254v) Crassa manus et grossa et digiti breues fictum, insidiatorem, non fidelem ostendit. Manus magne et gibbose tenues loquacem audacem comestorem et pecorem(?) ostendit. Si 4 digiti extensi iungantur sic quod non appareant fenestre extra, signum est inuidie. Et de opposito, oppositum.

Si pollex versus alios digitos et alii digiti versus eum se inclinent, auaricie et malicie signum est, si talis dispositio a frigiditate non causatur. Et si homo ex consuetudine teneat manum latam et digitos in longum, signum est loquacitatis et inuidie. Et si manum plurimum teneat clausam, impetuositatem et iracundiam ostendit, quia iste condiciones per partes exteriores cognoscuntur. Digiti parui et tenues in vno, illud condicionis et scientie discreciones signat. Et si grossi et puri(?), audacem et inuidum.

Si vero bene mensurati et pulcre forme, bonos mores pronosticant.

Qui nimium se mouent et percuciant se de manu in manum, loquaces sunt et inuidi, secum loquentes fantastice et fraudatores. Et si quieti sunt, ab hiis moribus omnibus sensati iudicantur et prudentes. Tremor manuum in iuuentute(?) cito iracundiam ostendit, quia non peruenit nisi ex calore nimio et spirituum commocione. Et si motum fortis fuerit, signum est nature viciose pauiditatis, vecordis et complexionis melancolice.

DE VNGUIBUS NOTANDUM quod vngues molles plane albe tenues lucide clare et vel rubentes bonum ingenium portendunt. (Curve) cupiditatis et habundancie pecunie signum sunt. Si digiti sunt multum macilenti et vngues curve, est signum ethice. Si vngues medio profunditatis ruditatem ostendunt, specialiter si caro manus super radicem habundat. Et si sunt rotunde, luxuriam. Et si magna apostema, adulationem promptissimam infirmitatem, et sepius cadunt in speciem lepre sive in lepram.

DE CUTE EST DICENDUM nam secundum naturales cutis est nervis subtilibus et venis capillaribus contexta quoniam ex intestina et alia membra subtilia est conuoluta a nocumentis conseruantur. Et in brutis est grossa et in hominibus est subtilis que per exteriora ac scilicet per vestes obseruatur. Et quia ex neruis est composita, ideo aliquando extenditur et aliquando restringitur per pinguedinem et maceracionem. Et quia cutis de sui natura non alba esse deberet et transparens, nam sanguinis rubor apparere debet, dico igitur quod color rubeus bonam dispositionem, fidelitatem, (255r) constanciam et debitam dispositionem in aliis membris ostendit, si naturalis est curis. Item color albus cum pallore cutis habundanciam fleumatis et defectum virtutis naturalis propter excessum fleumatis ostendit. Nigredo cutis obfuscata, illud signum est astucie. Rubedo spissa dolosum et fraudulentum pronosticat. Color inflammatus et oculi lucentes et mobiles iram ostendunt et furiam. Color rubeus et clarus, illud bonum ingenium et bonos mores ostendit. Color pallidus et non ex infirmitate dilectum a mulieribus cognitis vel multum

semen amittat. Et si pallorem interdum et rubeum est et iracundus. Si cutis palme grossa et dura fuerit, et non ex labore, cum rubore premii(?) litterarum, luxuriam, iracundiam et dolum ostendit. Cutis tenuis et rugosa, concio colore mutabilis (mirabilis) est iracundus. Si mollis et tenuis, fleumatis copiam et malam digestionem ostendit. Manus solida et plana et boni tactus, illud sanguinis denotat et digestionis bonitatem. Si manus est multum frigida in yeme et calida in estate, melancolicam signat complexionem. Si manus post prandium sint calide, digestionem non bonam signat.

**DE PILIS MANUUM NOTANDUM.** Nam si manus sint pilose, luxuriosum par-cium(?) vel diuitem ostendit et virilem complexionem habentem. Si in manu mulieris fuerint pili, est virago et caue.

Vide quod omnia signa data in isto tractatu inquirenda sunt in manu viri dextra et in mulieris sinistra, et aliquando in vtraque, si vna appareat contradiccio, quia secundum Aristotelem in libro de secretis secretorum, Vni medico noli credere nec duobus contradiccentibus. Pari modo si signa onueneris, secundum fortius iudica. ut superius de sororibus dictum est. Quando in extremitate abrupticii vel extremitate palme est .g. nauis de qua exit, .g. riuus, morietur in aqua salsa. Et quando hec est figura stelle, est bene fortunatus, et frequenter talis erit episcopus vel magnus dominus. Et quando tale signum, scilicet stella, apparuerit sub indice, talis sub recta ratione regulabit. Quando extremitas abrupticii est bifurcata, pertransibit 2 climata. Si trifurcata, tria climata. Si sub pollice ad abrupticum sunt multe linee perpendiculariter descendentes, talis fraudulentus erit domino. Et si sint intersecte ad modum crucis, multum laborabit pro diuiciis. Item si prima iunctura pollicisinradice habet lineas ad modum crucis rectas, sectum diuiciarum non habebit. Si vnam vel duas, sectum habebit. Item si vltima pollicis iunctura totum digitum circumuenit, signum est suspensionis. Si vero fuerit circularis et mediocriter scissa per punctum vel lineam, signum est non bone mortis. Item si inter illas duas iuncturas pollicis principales (255v) fuerint aliquae linee circular es, signum est quod tot habebit vxores, si vir; viros, si femina. Si vero fuerint prius concubians, tot si vir. Et tot amicos, si mulier, Et dicit Theophilus quod illud est querendum inter auricularem et abruptionem et quot lineas equales, tot vxores vel viros habebit. Si breues secundum maius et minus tot concubians habebit. Si quilibet digitus inter pollicem non habuerit nisi vnam lineam, talis morietur miserabiliter. Item cuiuslibet digiti lineam iuxta palmam non erexit circularis et si multe supra ad modum rethis, talis de facili morietur. Si due distant, pacietur in occulto. Item si habeat lineas latas parvas, luxuriosus est. Si (ab) abrupticum exit vna linea recta intersecans mediam, illud finem habebit bonum.

Si quis habeat magnos manus et digitos acutos in extremitatibus, cupidus est et falsus. Et si latos, est fidelis et rectus ad contribuendum, si est vir. Si vero est mulier, habet vuluam profundam et multum appetit virum. Si vir vel mulier, habeat latam tabulam et digitos graciles, subtilis est ad operandum manibus suis. Sed femina addit ad hoc quod habet vuluam latam in parte inferiori scilicet orificio et strictam iuxta matricem. Si vir vel mulier habeat paruam tabulam et digitos grossos, vir bene scribet et mulier habet voluam strictam in orificio et per quam malum partum, sed habet latam iuxta matricem et talis multum disponet ad concipiendum propter vasis latitudinem. Homo habens manus graciles, agilis, ingeniosus et cito verecundus est; cohit frequenter et diligit mulieres. Vir vel mulier habens digitos non rectos, et quando manus est aperta recta et digiti coniuncti, non apparent fenestre inter digitos, signum est quod verba illius non sunt consona operibus. Item quando non habet lineam rectam, signum est morbi caduci. Si abrupticum lineatur in puncto inter medium et indicem, talis indecenter morietur. Si abrupticum determinatur linealiter ad punctum in quo terminetur medium, talis constans, fortis, fidelis et verus. Si intersecat vna linea perpendiculariters inter punctum, indicem et abrupticum, talis in aptue morietur. Si abrupticum est rectum, talis est versus; si fractum, est falsus. Item quando exeunt parue linee de abruptico, talis est caute cautelosus et non de facili seductus, quia habet nequicias. Si inter digitos et abrupticum fuerint cruces, signant pericula. Et si vnum latus fuerit maius alio, maius periculum. Si autem inter abrupticum et mediam fuerint, magnos honores signant. Si vero mutantur sine honore morietur.

Si multe linee descendunt a digitis ad abrupticum, talis multa vulnera habebit. Sit autem extendant se ad montem vel abrupticum, ipse alia impendit. (256r) Si linea media incipit ab anruptico et non ad abrupticum, talis erit latro et cupidus, et caput sibi abscidetur vel pro malis suspendetur. Quando abrupticum est continuum, talis in patera morietur. Quando est discontinuum, talis diuersis infirmitatibus morietur. Quando de abruptico exent parue linee, talis mare transibit et numquam redibit.

Si in manu mulieris et circa angulum superiorem fuerit color rubeus et palma extensa sit planior quam ante, talis est bene disposita ad concipiendum masculos. Mulier habens manus fortes et euidentibus lineacionibus rubeas et non pallidas, virgo dicitur contentiosa gaudens in sanguinis effusione propter eam et in litibus non modicum. Si in muliere meretrice linea (tamen in MS) mensalis parum profunda, secta per lineas, discontinua, pallida, inequalisve fuerit, fluxum ventris et huiusmodi infirmitates alias ostendit in generativis, verendis et in ventre, quia hec linea partibus illis deseruit secundum sua iudicia sive bona sive mala. Mulier habens inter medicum cancellatas sine(?) cruce disposita est ad concipiendum masculos; inter medicum et auricularem, feminas. Mulier habens paruas manus, illa paruum habet vuluam vtraque extremitate et non appetit nisi se diligentem. Item mulier habens manus virides diafragma habet fractum et habet vuluam intumescen-tem et cito concipiet fetus sed non producuntur ad partum. Mulier habens manus grossas multum potest coire et parum diligit quia non habundat in colera (colora in MS) nec in sanguine. Si in manu mulieris fuerint cruces sub medio, medico, auriculario, signum est quod erit valde generatura. Et si in eisdem locis in manu viri fuerint hascule non intercise, illud signum est propagacionis et quot hascule tot filios (folios in MS) vel filias habebit. Et si aliqua hascula intret aliquem (aliquam in MS) dictorum digitorum, est signum quod ille filius erit maioris honoris quam pater eius.

In cyromancia notandum est quod nulla signa preter naturalia id est de non naturalibus sunt iudicanda et lotis manibus aqua callida. Signa naturalia indicantur per lineas naturales que sunt mensalis, mediana, dextra trianguli et basis eiusdem, et linee existentes in iuncturis digitorum et recepta manus. Hee enim sunt naturaliter in manibus, quamvis multi carent aliquibus in toto vel in parte propter defectum nature aut propter labores graues et (256v) aliqui econtrario habent multas lineas propter labores et operationes ut textores, sictores et huiusmodi. Et aliqui habent diuersas lineas superfluas propter infirmitates, ut scabiosi, vulnerati et huiusmodi; aliqui autem paucas vt rustici qui habent callosas manus quia cum duris instrumentis abrumpunt lineas tam naturales quam accidentales, ut carpentarii, fabri et huiusmodi.

Vnde tales cogniciones linearum sunt perscrutande secundum quod ipsius cuius est manus est officium vel status tam viri quam et mulieris. Si queratur vtrum significacionibus huius sciencie potest resisti, respondemus cum philosopho (rum added in MS) quod sapiens dominabitur astris. Vnde si quis haberet signum quod deberet submergi in aqua, caueat ne intret aquam quamvis multum desideret intrare, et sic eudaet (auadet in MS) periculum eius, et consimiliter si habet signum suspensionis vel huiusmodi potest resistere per prudenciam et nature resistenciam, quia, quamuis sit initium a complexione, corrigitur bene econtra cum operantis deliberacione.

Si talis figura . . . reperiatur in auriculari, furem et latronem signat. Si in percussione manus reperiatur tale signum d., mortales inimicos ostendit. Si autem in manu iuxta lineam vite prope receptam inueniatur talis figura . . . , patricidam vel sacrilegum. Et si eadem vel talis figura inueniatur in muliere, meretris est nequissima. Si in manu sint multe linee transversales scindentes lineas naturales, signant pericula circa diuersa. Si in maau sint pauce, hominem brutalem ostendunt. Et si in radice medici quedam linea recta per medietatem eius est extendens vel prope, subtilem denotat eritque talis grossus(?) et magnus in animo. Si supra dorsum indicis talis figura . . . inueniatur, luxuriam, beneficium et honorem ex causa mulieris prouenientem. Si in suppressis (supprimis in MS) iuncturis horum 5 digitorum in interiori parte riuale quasi crepature in medio ad modum circulorum paruorum concurrant, auarum et tenacem portendunt. Si in triangulo mulieris multa sordida(?) fuerint intercepta rubedine et talis figura . . . erecta ibidem, tunc mulier

illa de filio dicitur esse pregnans. Si linea epatis vel stomachi versus brachium fuerit bifurcata, illud malam mortem signat in muliere propter partum vel aliud factum. Si strictum anguli vacuum fuerit, honeste mprtis signum est. Si vero ante finem trianguli, ex transverso linea transierit et ab illa vsque ad finem alia dirigatur, aquis(?) ostendit mori. Sed si transversari (transuersam in MS) viderit et finem transierit, aqua vel igne mortem venturam denunciat: versus finem longior, aqua; superius, illud igne. Si in latitudine trianguli hoc signum fuerit, virgo est preter has si riuule vel linee variant ut pro modo fidendi signant. Si parue, animi instabilitatem. Si magne, loci mutacionem. Si iuxta lineam vite a pede superioris naturalis equalis aliquando dirigatur ipsi (257r) signum est matri-monii; si inequalis, adulterii. Et si aliquam istarum non peruenientem ad mediam naturalem, riuula vel linea ex media naturali veniens in capite tetigerit, suspendetur. Si circa pedem prime naturalis quasi .i. fuerit, hic homo episcopus erit. Si iuxta ipsam alia linea extensa insumitate sui versus foveam, lineam talem habuerit, ille rex erit. Si a pede superioris vel ab alio pede veniente linea procedens versus conum exierit, peregre ibit. Si prima naturalis a sui medietate versus pedem superius, illud capitis dolorem; si a sui medietate versus finem superius, colli dolorem signat. Linea vite ab ipsa procedens, si in principio capitis(?) simul extiterint, cordis dolorem pandit. Vltima linea naturalis in fine linea naturalis in fine sui talis, illud notat ventris dolorem.

Si mons plenus fuerit lineis, ab infirmitatibus cito euasurus ostendit; zi paucis, illud contrarium. Inter duas pollicis iuncturas in latere montem respicientes si ex transuerse multe et magne linee transierint, multam et magnam parentelam ostendunt; si pauce et parue, paucam et paruam. Indicis linea finem respiciens patrem matri, ex transverso transiens matrem patro preponi. Si has lineas pollicis parentele indices due linee fortiter fiderint, lectum matris violabit. Si in vltima iunctura pollicis subtus ipsam, supra lineam iuncture hec signa apparuerit 2.22., matrem vel germanam corrumpet. Sed hec eadem fidelitatis vel infidelitatis est signum vel index: si fere iungant, infidelitatis; si non, fidelitatis.

Vnguis pollicis per iuncturam recurus morosum(?) vivit. In cono percussiois manus linee ab intus tunc econuerso exiunt, si multe et non implicite fuerint, honestatem, si pauce vel implicite, prauitatem ostendunt. Si in ipso cono hec figura .6. extra versus dorsum manus resperxit, patricida tali signo quasi sagitta ab ipso cono intus acumen suum porrigente t.E. Quot quot linee mediam lineam naturalem diuiserunt sive inferiorem tangunt, (257v), sive non, pueros nunciant. Si non, alterius rei notande. Riuule siue linee eidem naturali adherentes siue suora siue infra, recte lemes alternate et minus apparentes grauem licet occultam iram manifestant. Hoc idem est in superiori diuisa a media a loco extra. Si vero in media naturalis quasi punctus apparuerit, vnum oculum amittet; si duo, duos. Si vero super se in fouea quasi .6. inceptit et per ipsam transiens imersa cornua posuerit quod novum est conuersionis. In quacumque sui parte magis ab vltimo discuterit ex tempore plus felicitatis ostendit. Et si ipsa circa finem sui in ipsa mensa quasi crux  $\perp$  appareat, vim illud dominandi. Alibi in mensa confessionem vel secundum quosdam luxuriam. Si vltima linea naturalis gradatim versus indicem descendit, gradatim felicitatem vel accumulari (accumulati in MS) accomodas. Si quasi subito se precipitante subitum bonum amplificat. Si vero sursum tetenderit, contrarium operatur nisi alia subtus ipsam prohibeat. Hec eadem sursum tendens labore proprio degere non negat. Et si ab ipsa versus alia indicem descenderit, illud mori in ex(c)oticis arguit. Sed si ipsi in mensa quasi triangulus adiaceat, prebendam notat. Si ab media ad ipsam fortis virga transiat illud in viris tot capciones quot virge, in mulieribus partus. Hoc idem notat hec figura . . . et si intus ad mensam magis quam extra se sparserit, tanto grauiorem capicionem pronuntiabit. Et si (in) mensa hoc signum apparuerit, illud humani sanguinis situm probat. Hoc signum in mensa conuersum existens, illud meretricem signat. Et secundum (si in MS) quosdam si ab vltima linea non directe sed oblique per mensam ad mediam naturalem linea se porrexerit, ille quandoque exhereditabitur tarde vel non secundum loca mense(?) habent vltimam lineam naturalem et quantitatem Auricularis riuule siue linee siue ex transverso siue ex directo positee volnera brachiorum vel manuum

signant et a fine minimi fere vsque ad finem secundi linee sibi disposite volnera pedum vel cruriumsignantur Et a fine secundi a(ut) minimo vsque ad finem tercii linee et pro-  
venerut sursum tendentes volnera capitis portendit.

(258r) Ubi autem illi tres dgiti palme coniunguntur, si linee eorum medietatem diuise-  
runt, volnerum in lateribus indices erunt. Rioula vel linea ab vltima naturali ad quarta  
directa digitorum pro sui pressura et sui furcacione et ad medium digitum directa porreccio-  
nem amplioris ingenii et plurium et profundarum scientiarum nota est. Post ista inter  
vltimam naturalem et auriculum talis virga exiens comminatus est. Ibidem hoc signum  
. . . fatetur proximicidam. Et hoc signum sursum naturale .9. mori cibi penuria. Circa  
eadem loca baculus episcopalis, castitatem.

- 1 Hoc signum . . . alicubi pedum amissionem. Hec duo signa designant hominem car-  
naliter commiseri cum matre vel sorore.
- 2 Hoc signum portendit magnum gaudium incontinenti futurum.
- 3 Et hoc portendit maximam iram et rancorem.
- 4 Et hoc arguit diuicias in iuuentute et solacium.
- 5 Item hoc signum prenoscit diuicias in media etate.
- 6 Hoc idem signum diuicias in senectute.
- 7 Hoc signum offendere iniuste patrem vel matrem vel sororem.
- 8 Et hoc signum denotat virum fore presbiterum secularem vel religiosum.
- 9 Hoc signum nigrum in vngue designat in breui bona vel facultates amittere.
- 10 Et hoc signum designat habere vulnus in capite.
- 11 Est hoc signum.
- 12 Signat magnam inimiciam vel mortem subitanam.
- 13-14 Et hoc signum designat hominem fore collectorem diuiciarum et hoc idem alibi perdere  
diuicias.
- 15 Hoc signum signat fore hominem armorum.
- 16 Hoc signum portendit parum fore luxuriosum.
- 17 Hoc signum arguit aliquem vel amicum(?) fore virginem in cogitacione et opere. Hoc  
signum signat magnum honorem. Et hoc portendit promocionem ecclesiasticam. Hoc  
signum prenoscit fore episcopum. Hoc signum signat hominem sepius velle sponte con-  
fiteri de luxuria.
- 21 Hoc signum in muliere signat mori in partu filiorum.
- 22 Hoc signum prenoscit cito in infirmitatem (258v) grauissimam incidere vel mortem  
subitanam.
- 23 Hoc signum signat cupiditatem et nullam habere paupertatem.
- 24 Hoc signum portendit viagiam que numquam perficietur siue peragetur.
- 25 Et hoc signum significat hominem vel mulierem fore religiosam personam.
- 26-27 Hoc signum prenoscit offendere patrem. Hoc signum prenoscit alicui maximas  
peregrinaciones facere.
- 28 Hoc signum arguit aliquem in honorem et dignitatem prioris vel abbatis promoveri.
- 29 Hoc signum portendit in aliquo firmam fidem.
- 30 Hoc signum prenoscit in aliquo homine carnaliter commiscere cum moniali.
- 31 Hoc signum arguit aliquem vel aliquam luxuriose vnde vel luxurie deditur.
- 32 Et hoc signum designat magnam corporis passionem.
- 33 Hoc signum portendit maximum votum vel per alicuius linguam s.i. loquelam falli et  
decipi.
- 34 Hoc signum in muliere significat fore vxorem militis vel magnum labor em toto tempore  
vite ipsius.
- 35-36 Et hoc signum designat gestantem magnas peragrarere peregrinaciones. sed hoc signum  
infirmitates leprose est argutium.
- 37 Et hoc signum designat vitam et mortem .i. subitanam mortem vel vite periculum.
- 38 Hoc signum significat submercioem in aqua.
- 39 Hoc signum optime et deuotissime aliquem vel aliquam designat fore confessum.
- 40 Hoc signum pronoscit in gestante mortem honestam.

|    |  |                      |
|----|--|----------------------|
| 41 | Hoc signum designat aliquem vel aliquam amare magis patrem quam matrem.        |                      |
| 42 | Hoc eciam signum significat aliquem fore subtilem in mechanicis vel huiusmodi. |                      |
| 43 | Hoc signat tot amicos quot fuerunt signa in vnque.                             |                      |
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